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# International Macroeconomic Adjustment, 1987-1992

## A World Model Approach

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and
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Three global econometric models produced the same conclusion: that the global economy is most likely to improve through fiscal expansion in Japan combined with fiscal contraction and monetary easing in the United States. The same models forecast a slowdown in 1988 and low growth in 1989/90 followed by US recovery in 1991-1992.

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In forecasting key economic indicators for the major industrial countries, the Bank's Economic Analysis and Prospects Division (IECAP) does not rely on a completely linked global macroeconomic model.

Would IECAP forecasts be consistent with forecasts produced by linked models?

To find out, researchers introduced Bank assumptions about exchange rates and commodity prices into three global models — under the auspices of the OECD, Project Link, and Wharton Econometrics (The WEFA Group).

Differences existed between the IECAP forecasts and the model results — and between the model forecasts (using Bank assumptions).

But given Bank assumptions, the three models agreed on the medium-term forecast: a small slowdown in 1988, low growth in 1989 and/or 1990, and recovery in the United States in 1991 and 1992.

Simulations on all three models also produced the same conclusion about policy: that the global economy is most likely to improve in 1989/90 and stabilize in the 1990s through a combination of fiscal contraction and monetary easing in the United States combined with fiscal expansion in Japan.

This paper is a product of the Economics Analysis and Prospects Division, International Economics Department. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Karen Adams, room S12-057, extension 33738.

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## I. INTRODUCTION*

The Economic Analysis and Prospects Division (IECAP) of the World Bank produces forecasts for several key macroeconomic indicators of the major industrial countries. These forecasts are then used as inputs into the Capital Flows Model (CFM), which produces projections for some 90 developing countries. In addition, several divisions in the Financial and Operations complexes of the Bank use the industrial country forecasts as inputs in their work.

IECAP does not currently have a fully linked macroeconometric model of the industrial country forecasts. Are, therefore, the IECAP forecasts consistent with the forecasts produced through the use of several major fully linked world models? The purpose of this paper is to explore the key differences between IECAP's forecasts and those of organizations using linked models, and to explain why the differences occur.

Several organizations have agreed to let us use their models for this purpose. This paper will compare simulations using OECD's Interlink Model, University of Pennsylvania's Project LINK, and Wharton Econometric's

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(WEFA) World Model.[1] The next section explains the structure of each model. Section III begins the process of explaining and elaborating on the differences in the forecasts, through a comparison of the key assumptions used in each model. Section IV pr .ents a comparison of the IECAP baseline with the baseline forecast presented by each organization. Forecasts of the same general vintage are used for research purposes, and are not meant to reflect current thinking by any of these organizations.[2] In Section V, the results of model simulations using IECAP's assumptions for exchange rates and commodity prices will be discussed. In Section VI, an attempt is made to explain the differences in the projection results. These differences to a large extent depend on the simulation properties of each model. These properties may in turn be examined through the running of simulations to test each model's multiplier effects. Following this, a set of alternative scenarios using each model is presented. Finally, in the last section, the main conclusions are presented.

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1/ These organizations have graciously agreed to let us use our own assumptions in running their models. They bear no responsibility for any inconsistencies in the output and the results should in no way be interpreted as having their approval.

2/ For Wharton, this is the December 1987 forecast. For the OECD and IECAP, this is the January 1988 forecast. For Project LINK, this is the March 1988 forecast. Forecasts of the same general vintage are used for research purposes, and are not meant to reflect current thinking by any of these organizations.

## II. MAIN ARCHITECTURE OF THE WORLD MODELS

### A. Wharton (WEFA) World Model

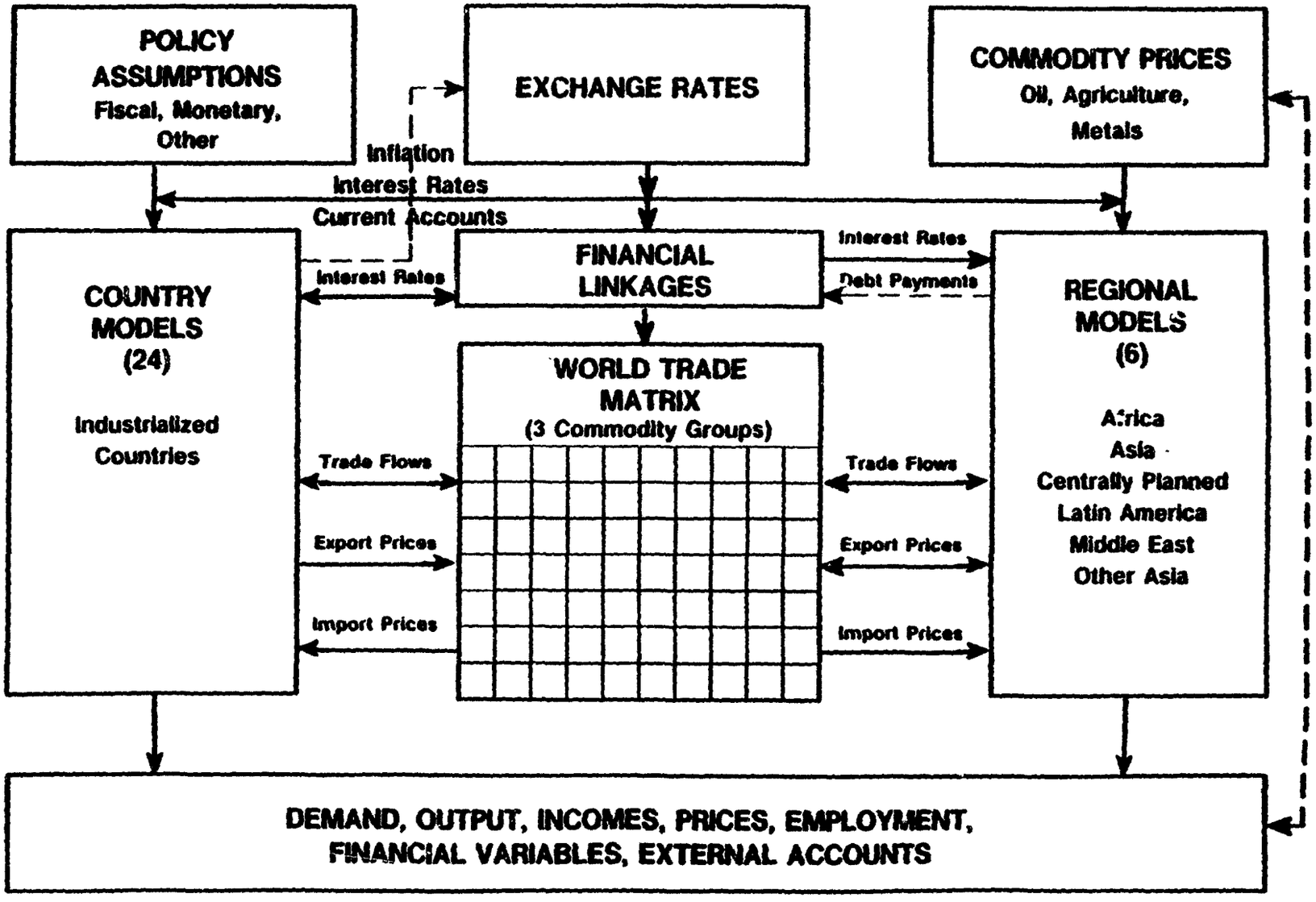
The Wharton World Model is an annual model which links 24 industrial country submodels and 6 regional submodels, of which 5 represent developing country regions and one that of the centrally planned economies (CPE) which include China. These models are linked together through a world trade matrix which consists of 3 commodity groups. The three commodity groups are: (i) fuels, (ii) other primary commodities, and (iii) manufactured goods. The linkages are through both trade flows (the real goods side) as well as through capital flows (the financial side).

For the real side of the economy, import demand and export prices are solved endogenously by the 30 submodels. These two variables are then inputed into the world trade matrix, which in turn solves for the export demand and import prices facing each country. The solution process is an iterative one (a modified Gauss-Seidel process) which ends only if the variables at both the submodel and world levels converge.

As for the financial side of the economy, the industrial country models are linked to the rest of the world through exchange rates and interest rates, while the regional models are linked to the rest of the world mainly through interest rates. Each industrial country model solves endogenously for the interest rate, inflation rate and the current account. These in turn determine the exchange rate which would be faced by the rest of the world both for trading purposes as well as for debt repayment

FIGURE 1

# WHARTON ECONOMETRICS WORLD MODEL SYSTEM



purposes. In addition to this indirect linkage via the exchange rate, the interest rates of the industrial countries are also linked directly to the developing countries via the latter's debt service payments. They would therefore also have the secondary effect of affecting the latter's import capability and hence their trade flows with the rest of the world.

Turning now to the structure of the individual submodels, all 30 submodels solve endogenously for demand, output, incomes, prices, employment, and financial variables, as well as the external accounts. The exogenous variables used in the models differ, however, between the industrial country models and the regional models. The industrial country submodels take for their exogenous variables policy assumptions, mainly fiscal and monetary. The regional models, on the other hand, take for their exogenous variables commodity prices (although Wharton is in the process of endogenizing commodity prices).

B. OECD's Interlink Model

The OECD Interlink model is an integrated world model which combines a set of semi-annual macroeconomic models for 24 OECD member countries (Belgium and Luxembourg are combined) with a reduced-form balance of payments and trade module for six non-OECD country groupings.[3] These non-OECD groups are: (1) the OPEC low-absorption countries; (2) the OPEC high-absorption countries; (3) other oil producing countries; (4) the newly industrialized countries; (5) low- and middle-income developing countries; and (6) the Socialist Bloc countries.

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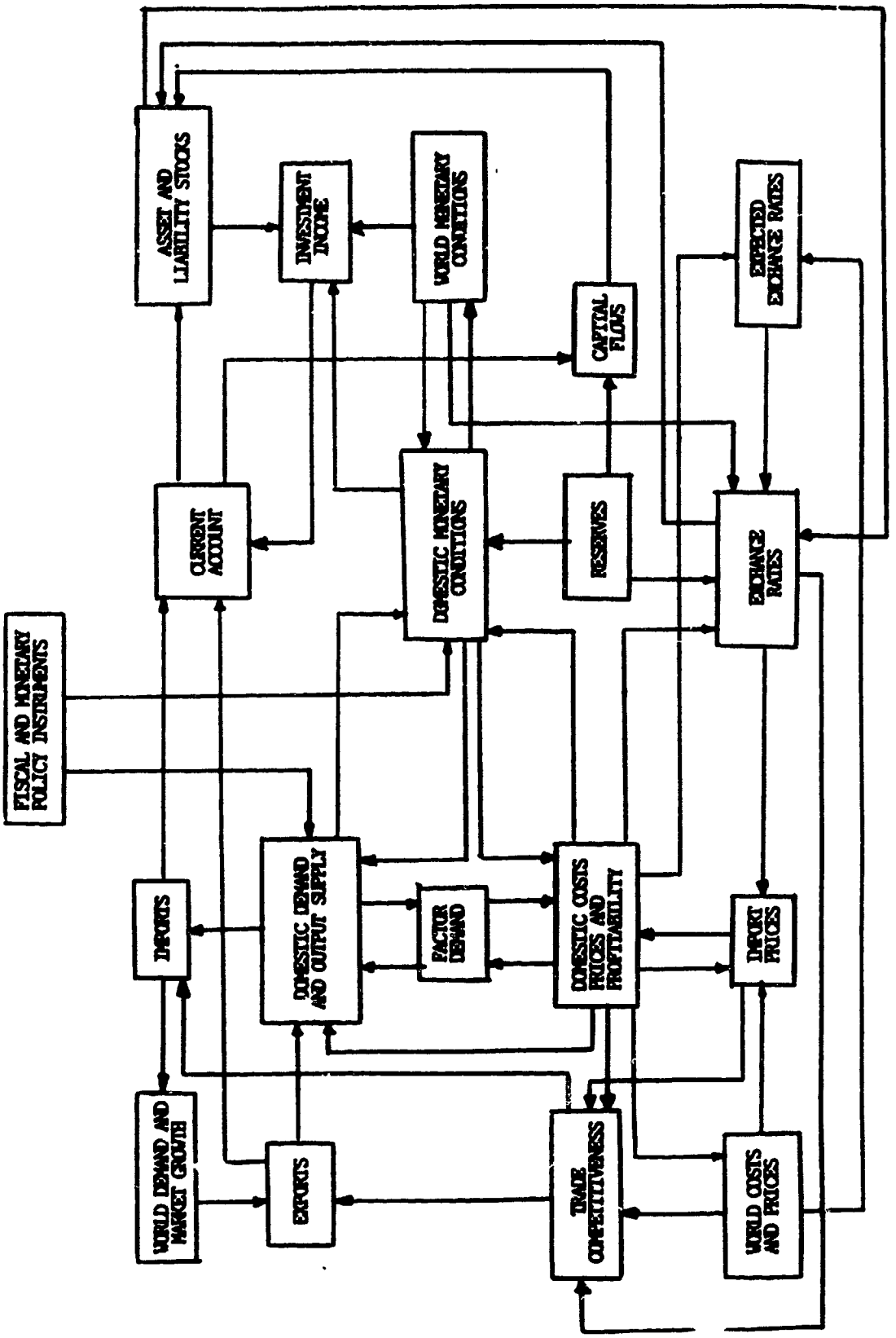
3/ Belgium and Luxembourg are combined in the system.

Figure 2

TRADE AND FINANCIAL LINKAGES IN THE INTERLINK MODEL



Individual country models vary depending on country size and data availability. Those for the smaller OECD countries typically contain about 130-140 equations with 50 or so equations behavioral in nature, while the larger country models contain 200-250 equations, of which about 100 are behavioral. Still, despite differences in the number of equations and data availability, the structure of the models is very similar.

On the domestic side, each model reflects a basic national accounts breakdown, including factor demand, nominal and real GNP, prices, and private and public sector accounts. Consumption and investment are handled explicitly, and are broken down into various public and private sector components.

The domestic side of the model contains a supply block, which covers the entire economy except for the general government sector. This block combines a three factor production function with consistent demands for factor inputs, labor supply and participation equations, and short-term business sector output. In addition, the domestic side includes a wages and prices block, a fiscal block, household and business sector accounts, government sector, and a domestic monetary sector.

The external side of the model features sections on trade and non-factor services, trade volumes, trade prices, investment income flows, and exchange rates. This part of the model is linked to the six non-OECD country regions. Exports of goods and services for the non-OECD countries

are determined by commodity classification[4] in the same way as for the OECD countries, depending on changes in market growth, and, for non-primary exports, price competitiveness.

Imports of the developing countries are determined as a function of export revenues, adjusted for net interest payments, net changes in transfer, and financing flows. Spending coefficients and adjustment speed vary across country groups. Investment income provides an important link between monetary conditions in the OECD and non-OECD countries' behavior. Primary goods export prices are linked directly to the commodity price submodel. Non-OECD producers are assumed to be price takers for manufactured goods, with prices moving in-line with average OECD price levels. Energy prices are exogenous and assumed to be constant in real terms during the forecast horizon.

C. Project LINK System

The LINK system is a quarterly model (for the OECD countries) which ties together the national macroeconomic models of the major countries and regions of the world through a world trade matrix. Unlike the Wharton World model in which both real (traded goods) and financial (capital flows) linkages are included, the LINK system only takes into account the real side linkages, that is, goods traded between the countries, and financial

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4/ OECD provides forecasts for four commodity groups: (i) food, (ii) agricultural raw materials, (iii) metals and minerals, and (iv) tropical beverages, as well as for manufactures.

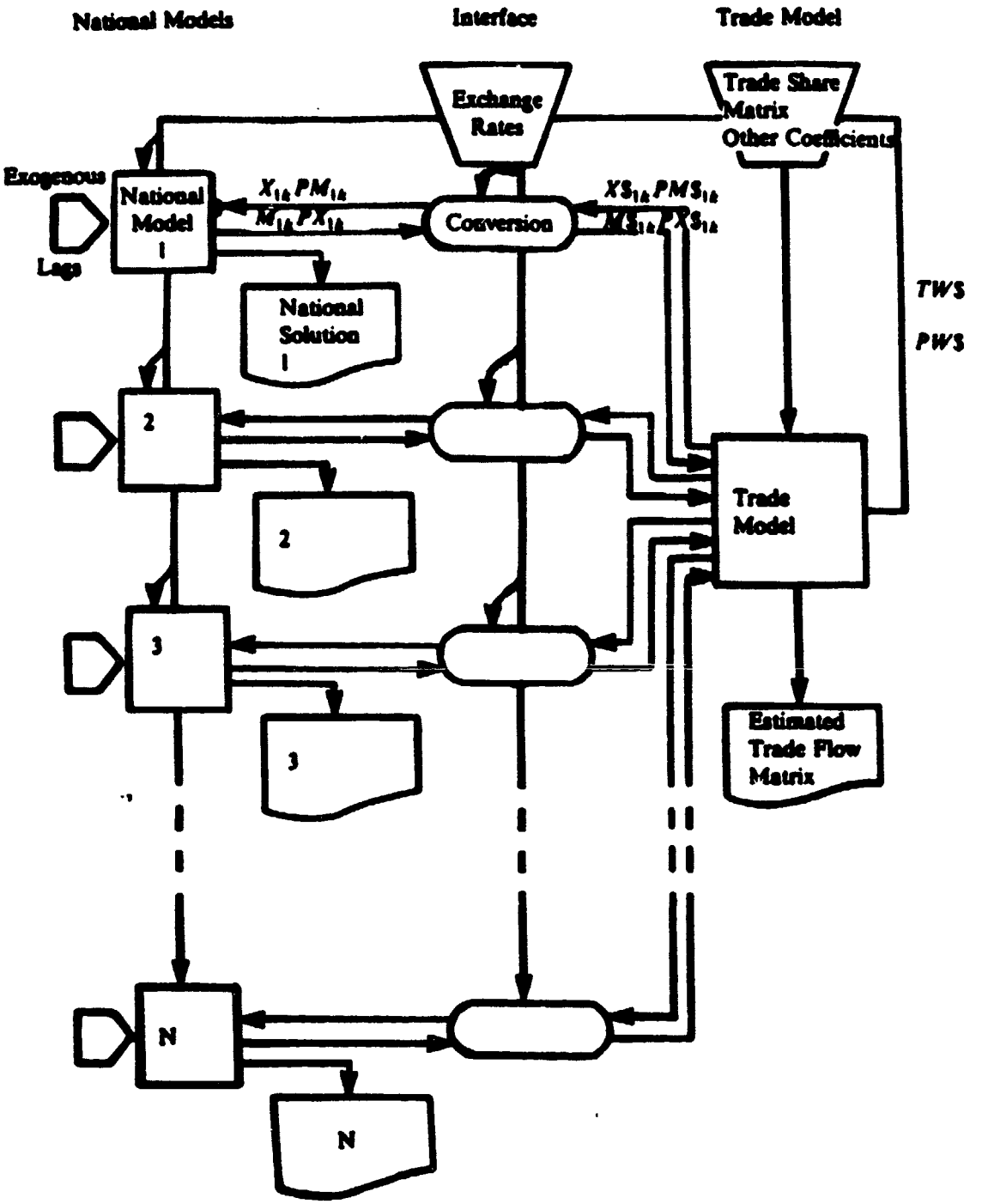


Fig. 3. Schematic diagram of LINK system.

linkages are only implicitly taken into account. Another major feature which distinguishes the LINK model from the Wharton World model, as well as the Interlink model, is that instead of using a prototypical country model to represent all the industrial countries, the LINK system consists of individual country models which are unique in their construction. The rationale behind this feature is the assumption that each individual country modeler knows his/her own country best.

As mentioned above, the key to the linkage is the trade accounts, the design of which are identical for all the models. This is the only point where freedom of model structure ceases to exist. For the purpose of LINK calculations, the trade accounts for each country are divided into four major commodity groups, which are: (i) food, beverages, tobacco (SITC 0,1); (ii) basic materials (SITC 2,4); (iii) fuels (SITC 3); and (iv) manufactures and other (SITC 5-9). The LINK trade matrix consists of these four trade categories for each of the individual country or regional groupings. Solving the LINK system involves iteration of the model until total world exports (FOB) is equated to total world imports (FOB), both in constant and current value terms.

The algorithm for solving the LINK system is as follows. First, each individual country or regional model is solved, taking as exogenous variables exports and import prices. The endogenous solutions of imports and export prices are then fed into the LINK trade matrix, which takes these solutions and generates as output exports and import prices. These latter solutions of exports and import prices in general differ from those

FIGURE 4

## COUNTRY COVERAGE

| WEFA | Interlink | Project LINK |
|---|---|---|
| Individual Models | | |
| 23 OECD<br>South Africa | 24 OECD | 24 OECD<br>8 CPE<br>39 LDC |
| Regional Models | | |
| Latin America<br>Africa<br>Pacific Basin<br>Arabia Gulf Oil Producers<br>Other Asia<br>CPE | OPEC Low-Absorption<br>OPEC High-Absorption<br>Other Oil-Producers<br>NICs<br>Low- and Middle-Income LDCs<br>Soviet Bloc | Caribbean<br>Africa Low-Income<br>Other African<br>South East Asia Low-Income<br>Other South Asia<br>West Asia Oil Importers<br>Other West Asia<br>Other LDCs |

used initially in solving the individual models. The process is repeated again and again until the final solutions for exports and import prices do not change from the last simulation.

The LINK trade matrix consists of a trade shares matrix, which may be assumed to be a set of technical parameters. As an illustration of this trade shares matrix, where countries are concerned, the diagonal elements of the matrix are zero, since a country does not trade with itself internationally, and where regions are concerned, intercountry trade within the regions is entered on the diagonal. The problem arises that the trade shares matrix is not constant, since trade shares change over time, and much of the current LINK research is devoted to attempts to project the elements of the trade shares matrix for their dynamic movements.

## III. ASSUMPTIONS FOR KEY EXOGENOUS VARIABLES

### A. Exchange Rates

According to the IECAP January 1988 forecast, the U.S. dollar exchange rate is expected to depreciate further in the 1988-89 period because action on the part of the U.S. Administration will continue to be inadequate to correct the U.S. twin deficits. In the face of continued financing needs for this massive overhang of U.S. debt, the financial markets will step in to lower the dollar exchange rate. The already large amount of U.S. securities outstanding and the expectation of continued financing needs for this debt both render the further purchase of dollar

securities unattractive to foreign investors. On the other hand, the supply of such securities is ever-increasing in order to finance the debt overhang. The market outcome of this lowered demand and increasing supply would be a further depreciation of the dollar.

A new trough of the dollar is expected to be reached in 1989, at which time the new U.S. Administration, spurred by an atmosphere of mounting crisis, is expected to take action to correct the twin fiscal and trade deficits. Accompanying this further fall in the dollar (to a new trough) would be a rise in nominal interest rates in the U.S., which would serve to counter what might be even further depreciation of the dollar so as to continue attracting financing capital from overseas. This rise in the nominal interest rate would also be the consequence of higher domestic inflation as the "pass-through" of the dollar devaluation to nominal wages is gradually completed. At the same time, there would be further declines in the prices of stocks and bonds, paring down private real wealth and therefore domestic demand in the United States. The continued devaluation of the dollar would eventually be reversed both through government action and the market. The new U.S. Administration is expected to significantly reduce Federal borrowing requirements. This reduction in the fiscal deficit, together with a decline in private real wealth would shrink domestic demand considerably, serving to help correct the current account deficit.

By 1991, the corrective action taken on the twin deficits would have had its effect. The deficit on U.S. merchandise trade would have been reversed and be on its way toward a surplus. Moreover, the earlier decline

in domestic demand would not be prolonged as monetary policy would be relaxed (due to a somewhat higher tolerance for inflation), real interest rates would be lower (due both to weaker domestic demand as well as expectations of reduced "crowding out" in the future), and export-led and import-competing demand would be higher (due to the further weakening of the dollar which took place earlier). As a result, inflation would once again emerge as the major policy concern. Both fiscal and monetary policy would then err on the side of restraint, given the recent painful contractionary experience and the fear that U.S. households would attempt to too quickly recoup the massive income losses incurred in the 1985-1990 period. In the meantime, because of continued real economic slack in Europe, financial surpluses generated there would again be exported to the United States. The dollar would appreciate again as capital flows to the U.S. exceed its deficit on the current account.

Hence, what we would see for the path of the dollar exchange rate would be a long cycle (of approximately 10 years). This pattern is predicated on the assumption that the current regime for fiscal and monetary policy would not be modified. This regime is one in which U.S. fiscal and monetary policies follow the usual path of being belated and independent, instead of being anticipatory and coordinated. Thus, there would probably be an "overshooting" of the dollar, a result of the U.S. being overzealous in its anti-inflation stance and following an overly-restrictive monetary policy and hence forcing up the dollar. The dollar is therefore expected to continue on an appreciating trend into the mid-1990's, with the U.S. moving into a trade surplus.

The WEFA forecasters also incorporate variable exchange rates in their forecasting model. The assumption is that monetary authorities worldwide will agree to let the U.S. dollar fall in foreign exchange markets to avoid causing any further major disruptions to the international monetary system. It is expected by the WEFA group that much of the readjustment in the U.S. will come through an effort to bring up the level of private savings while at the same time making U.S. assets more attractive to foreign investors by letting the U.S. dollar depreciate.

For the 1988-1992 period, both the Wharton and the IECAP exchange rate forecasts show a further depreciation of the dollar, reaching a trough in 1989 against the other major currencies, followed by a rebound. This reflects a similar assumption in both models that initially the market will step in to correct the imbalance through a lowering of the dollar exchange rate in the face of as yet inadequate government action to correct the twin deficits and the resulting massive overhang of the U.S. debt. It should be noted that the IECAP forecasts show a greater depreciation of the dollar than the Wharton forecasts.

Both models show an upturn of the dollar after 1989, probably because both models assume that corrective action on the twin deficits, through the market as well as policy action, will be working out its effect in the economy. However, while both models show an appreciation of the dollar after 1989 in the period up to 1992, the IECAP forecast actually shows an "overshooting" of the dollar to a level higher than that in 1987 (due to a lag in adjustment in the goods markets), while the Wharton model shows either a return to 1987 levels or to levels not quite as high as the

1987 ones. No "overshooting" is forecasted for the Wharton model, probably because it does not assume an overly restrictive monetary policy to counter inflationary fears, or maybe because it assumes that monetary policy will be reigned-in later.

The WEFA forecasters also bring into the picture other exogenous variables which are supposed to stabilize global growth at levels not too far below present ones. For example, multilateral organizations like the IMF are assumed to make available to the LDC's at least some of the funds necessary to achieve domestic growth while maintaining the servicing of their debt.

At WEFA, it is believed there are some very important countervailing factors to the mid-October stock market crash that would make a major downward revision of their October, pre-crash forecast unwarranted. For instance, lower inflationary expectations and lower interest rates. This might be assumed to have the effect of lightening-up the debt-repayment, debt-servicing burden for the LDC's. In fact, the post-market crash global environment envisioned by the WEFA forecasters is a less hospitable one for the LDC's. Counteracting the advantage for LDC's of lower interest rates worldwide, the LDC's will see their export earnings dwindle due to sluggish growth in demand for imports in the developed market economies, as well as lower commodity prices. In addition, in the WEFA forecasters' opinion, constant reduction of the U.S. deficit on the current account over the next five-to-six years will come more as a result of diminishing imports into the U.S. than of buoyant export growth.

Real exchange rates are held broadly constant from the Economic Outlook 42[5] levels in the OECD forecast. The OECD expects that real interest rate differentials will be sufficient to sustain a pattern of constant real exchange rates. Given this assumption, the OECD forecast can only reduce the current account imbalances in the region if U.S. domestic demand moves differently than the rest of the OECD. Assuming no significant supply side effects, U.S. domestic demand will have to be below that of the rest of the OECD for the U.S. current account balance to improve. The nominal exchange rates, estimated as a result of these assumptions, show the U.S. dollar falling from 133 yen in 1989 to 121 yen in 1993 and from 1.68 DM in 1989 to 1.51 DM in the later year.

The OECD assumes a progressive tightening of fiscal policy in the industrialized nations. For the area as a whole, the net borrowing of government is expected to fall by nearly one percent of GDP by 1993, with Italy and Germany notable exceptions to this movement. In Germany, public borrowing will increase, especially as a result of a tax cut in 1990.

Monetary policy, on the other hand, is expected to be relatively neutral over the projection period, with nominal short-term interest rates relatively stable. In the U.S., monetary growth should be between six and seven percent. Money growth will be weaker elsewhere, especially in Japan and Germany.

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5/ OECD Economic Outlook 42. OECD, Paris. December 1987.

TABLE 1: Medium-Term Forecasts of Exchange Rate Developments Among the G-3

Bilateral Rates with Japan and Germany

(Expressed in Terms of YEN/$ and DM/$ Respectively)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| YEN/$ | | | | | |
| . IECAP | 123 | 121 | 130 | 150 | 186 |
| . WEFA | 131 | 129 | 130 | 137 | 140 |
| . Interlink | 134 | 134 | 131 | 128 | 125 |
| . Project LINK | 124 | 121 | 120 | 120 | N/A |
| DM/$ | | | | | |
| . IECAP | 1.42 | 1.34 | 1.54 | 1.90 | 2.47 |
| . WEFA | 1.63 | 1.56 | 1.57 | 1.63 | 1.63 |
| . Interlink | 1.66 | 1.66 | 1.63 | 1.59 | 1.54 |
| . Project LINK | 1.60 | 1.55 | 1.52 | 1.52 | N/A |

The OECD expects productivity growth to remain at 1.3 percent throughout the period; somewhat higher in Europe and somewhat lower in the United States. For the area as a whole, the growth in productivity is slightly faster than the growth in real wages. Therefore, the profit share will rise somewhat but probably not by enough to stabilize the rate of return on the capital stock. Still, with falling long-term real interest rates, investment is expected to pick up and be the fastest growing component of GDP.

In level terms, the Project LINK exchange rate forecast is much closer to that of the Wharton forecast than the IECAP forecast although in terms of the trend, it is quite different from both of them. As mentioned earlier, both the Wharton and the IECAP foreign exchange rate forecast show the dollar depreciating further against the major currencies, hitting a trough in 1989, then appreciating again. The Project LINK forecast, on the other hand, does not show a rebound of the dollar, but in fact, continued depreciation, though not a very steep one. The 1989 dollar exchange rates forecasted against all the major currencies except the yen are quite similar between the Wharton and Project LINK models, but they start to diverge after 1989, with the Project LINK dollar continuing to depreciate while the Wharton dollar starts to appreciate. On the other hand, the IECAP dollar exchange rate is forecasted to depreciate to a much lower level in 1989 than either of the above two forecasts, but also appreciate to a much higher level by 1991. The difference between these forecasts may be due to the fact that the IECAP forecast takes into consideration possible reaction of the financial markets to the current account imbalance while the LINK forecast disregards the financial side and instead only

reacts to the real side. As such, IECAF forecasts that the financial markets, impatient in the face of the remaining massive imbalances in the U.S. economy, step in and accelerate the correction of those imbalances through a further lowering of the dollar exchange rate. The LINK model, on the other hand, forecasts exchange rates endogenously as functions of interest rate differentials, inflation differentials, and GDP growth rate differentials between the countries. Underlying its forecasts are the assumptions that there will be a gradual correction of the current imbalances through a gradual depreciation of the dollar, that there will not be any volatility in the expectations of private investors, and that the monetary authorities in the major industrial countries will closely coordinate their policies.

## B. Commodity Prices

The IECCM (International Commodity Markets Division of the World Bank) forecasts for commodity prices, which are estimated independent of the rest of the forecast, contain a great deal of year-to-year variation. This variation consists mostly of downturns in prices in the near to medium term for some commodities, followed by upturns later. This cyclical pattern reflects one or both of the following: the IECAP forecasts of slower economic growth in the near to medium term followed by recovery after 1990, and/or bad weather in the near term leading to higher prices, overproduction and hence decline in prices even later. APPENDIX 1 gives a more detailed discussion of the price forecasts for each commodity group and the rationale behind them.

The WEFA assumptions for commodity prices differ a great deal from the IECCM assumptions. Given the large number of diverse commodity groups for which projections are made, it is difficult to conceive of a general unified theme for the price forecasts of all the commodity groups. One notable observation, however, is that the IECCM forecasts contain a lot more variation than the WEFA forecasts.[6] That is, the IECCM forecasts contain more of a cyclical pattern, which is also of a greater magnitude, than the Wharton forecasts.

While OECD's commodity price assumptions differ markedly from the projections made by the World Bank's IECCM Division on a year-to-year basis, over the course of the projections period the paths are quite similar.

Project LINK's forecasted trend for commodity prices in the 1988-89 period is generally flat or moderate because of the expected recessionary economic environment and the projected limited further depreciation of the dollar for that period. However, this general trend is in many instances overshadowed by individual market conditions such as drought in the case of rice and sugar, disorganized market conditions in the case of cocoa, and temporary inventory shortages in the case of copper.

Project LINK expects prices of metals and other industrial raw materials to rise moderately in 1988 and start falling in 1989. This is due to the expected slow-down in growth in the U.S. in 1988-89 and a

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6/ See APPENDIX 1.

moderate (and stable) rate of inflation. By the end of the forecast horizon (1991), these prices are expected to recover part of their losses. On the other hand, prices of agricultural commodities, in particular sugar and grain, are expected to rise in 1988-89 due to the drought in India and in neighboring countries, and to fall afterwards, as production is expected to return to normal levels.

Appendix 1 contains further information concerning the price forecasts included in each model for a wide range of commodities.

## IV. COMPARISON OF WORLD MODEL FORECASTS

For the most part, a comparison of the forecasts of Interlink, Project LINK, WEFA, and IECAP produce a very consistent and predictable pattern. With respect to almost every single variable under examination, and for pretty much all of the countries or groupings examined in this paper, by far the most conservative estimates are those produced by IECAP, followed rather closely by the LINK and OECD projections, with the WEFA forecasts displaying a moderate degree of optimism.

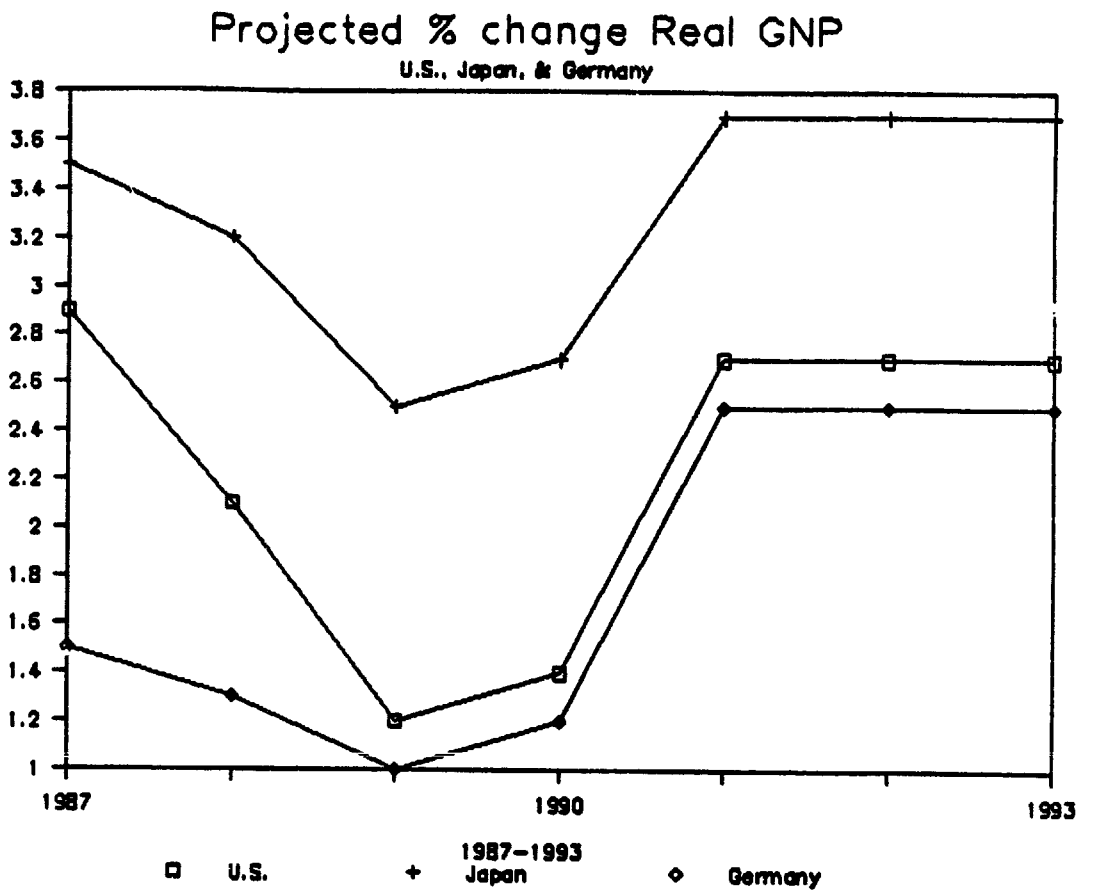
On average, IECAP's forecasts for the major OECD countries and for the area as a whole are quite similar to the forecasts produced by the OECD itself. It would appear that the IECAP forecasts tend to err on the side of caution, to the degree that they err at all.

Low growth in the U.S. (ranging from IECAP's forecast of 1.2 percent in 1989 to WEFA's 3.5 percent in 1991) over the projection period is due to a combination of the negative impact of last October's stock market crash on the domestic economy through the wealth effect, continued low levels of personal savings, and less stimulative (if not outright contractionary) macroeconomic policies. The latter policies are due to the necessity of reducing the twin U.S. deficits to more manageable proportions. While it has long been clear to economists that the twin deficits are creating a major economic problem, the stock market crash of 1987 brought this home to policymakers. Interest rates in the U.S. have been driven down somewhat to counteract the contractionary impact of the stock market crash on the economy, but not by as much as otherwise might have been done, due to a desire to encourage higher rates of personal savings.

The immediate prospects for growth in Germany and Italy are bleaker than those for the U.S. in the IECAP outlook. Germany is expected to continue on a path of very low growth due to: (1) the lack of sustainability of export-led growth over the long-term and (2) the lack of political will for generating a higher level of domestic growth with the resulting consequences for inflation.

Figure 5 shows that the relative rates of growth between Japan, the U.S., and Germany will remain nearly constant, according to IECAP's forecast, over the next three years. That is, although there are large differences in the rates of growth, movements in the growth rate will be similar.

FIGURE 5


Projected % change Real GNP
U.S., Japan, & Germany
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
1987
1990
1993
1987-1993
U.S.
Japan
Germany

For Japan, IECAP is not as pessimistic about future real GNP growth, and in fact, seems to be more trusting of Japan's widely proclaimed intent to fiscally stimulate their economy, allow the yen to appreciate against the U.S. dollar, and have their surplus on the current account marginally shrink, than the WEFA forecasters. However, Interlink is even more optimistic than IECAP in all these respects. From 1990 onwards, Project LINK displays the greatest degree of optimism.

Of all the projections included in this study, IECAP's expects the steepest pickup in U.S. inflation, followed by Project LINK, WEFA, and Interlink. This is consistent with IECAP's assumption of a further depreciating U.S. dollar which leads to a fuelling of domestic inflation via higher import prices. With respect to the current account balance, the U.S. does not show an improvement until 1989, as the January 1988 IECAP forecast allows for extended J-curve effects.

WEFA expects higher inflation in Japan, coupled with lower GNP growth, over the course of the next five years than either the OECD, IECAP, or Project LINK. This is due to an assumption that the more expansionary fiscal policy in Japan in the short-to-medium term will have a small multiplier effect on domestic GNP with most of the extra demand spilling over into higher imports. This is evidenced by the fact that WEFA records by far the greatest reduction in the Japanese current account surplus by 1991 among the three forecasting agencies. Project LINK's estimates of Japanese inflation are most notable for displaying the highest rate of inflation in 1987 of all of the models; and the lowest inflation rate in 1991.

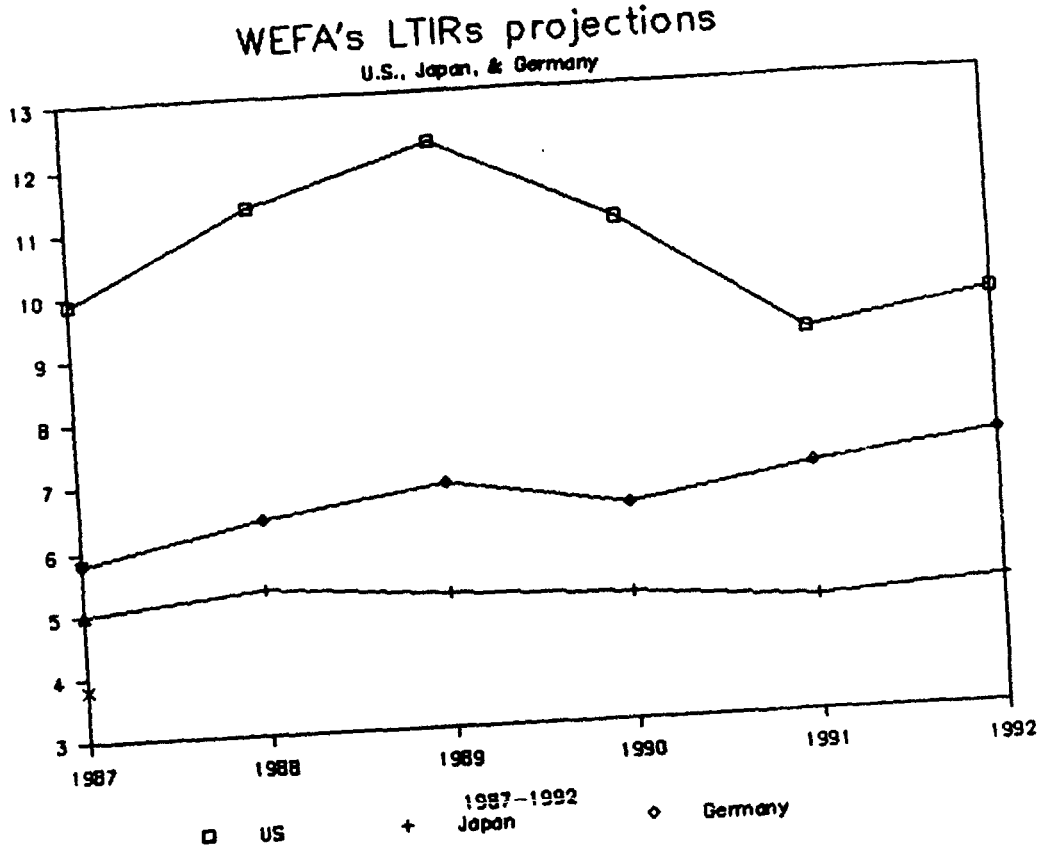
## TABLE 2: Inflation Rate Comparison

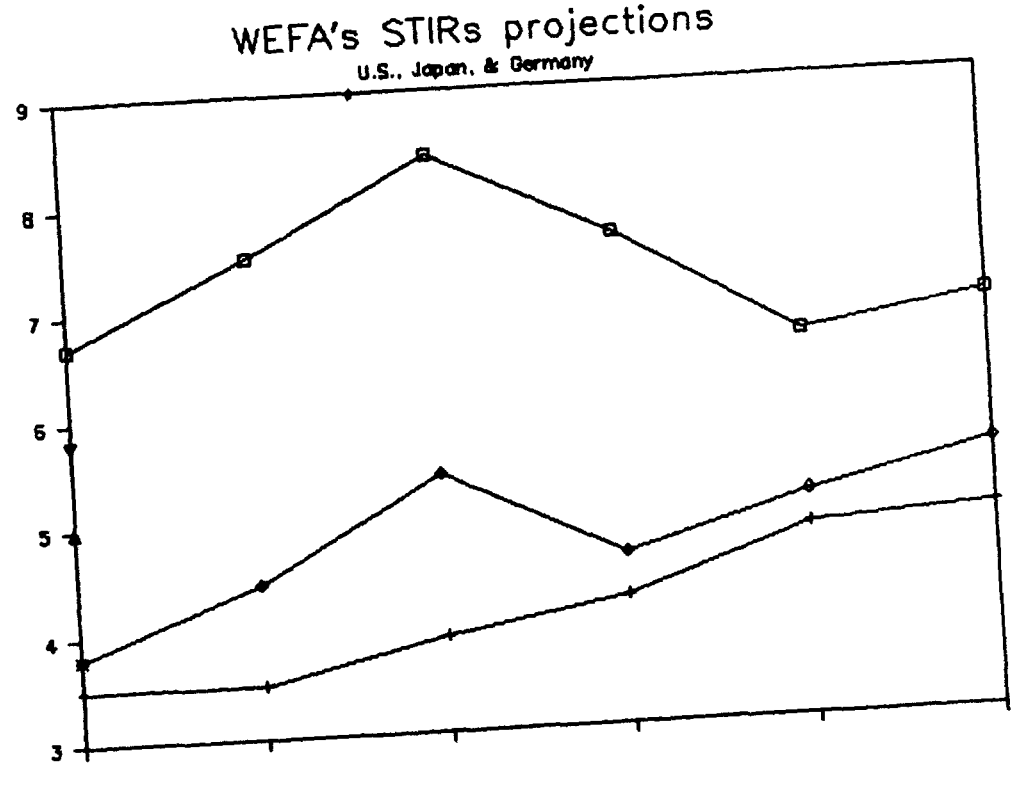
| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . IECAP | 5.0 | 5.5 | 6.0 | 5.0 | 5.0 |
| . Interlink | 3.6 | 3.7 | 3.9 | 4.0 | 4.2 |
| . Project LINK | 4.2 | 4.7 | 4.6 | 4.9 | N/A |
| . WEFA | 4.7 | 4.6 | 4.5 | 3.3 | 3.4 |
| **Germany** | | | | | |
| . IECAP | 1.8 | 1.8 | 1.6 | 2.7 | 2.7 |
| . Interlink | 1.7 | 1.7 | 1.6 | 1.4 | 1.3 |
| . Project LINK | 2.2 | 1.6 | 1.7 | 3.9 | N/A |
| . WEFA | 2.3 | 2.0 | 2.0 | 2.8 | 3.5 |
| **Japan** | | | | | |
| . IECAP | 1.0 | 1.8 | 2.0 | 2.5 | 2.5 |
| . Interlink | 1.0 | 1.5 | 1.4 | 1.5 | 1.5 |
| . Project LINK | 1.5 | 2.0 | 1.4 | 0.8 | N/A |
| . WEFA | 3.6 | 3.4 | 3.4 | 3.3 | 3.0 |

WEFA predicts higher inflation in Germany and Italy, as well as higher GNP/GDP growth over the course of the next five years than the OECD or IECAP. The reason for this difference is that WEFA assumes expansionary fiscal policy in West Germany, while the OECD, and presumably IECAP, expect a broadly neutral fiscal policy stance in Germany over the next few years and a contractionary one in the rest of Europe with the resulting consequence of a rise in the unemployment rate. In fact, due to tax reform measures, private consumption is seen by the WEFA forecasters as the main contributor to German growth in the imminent future. On the other hand, Project LINK's estimates of the medium-term inflation rate for Italy are higher than anyone else's; its projection of German inflation (CPI) is also the highest.

Monetary conditions in both Japan and Germany are assumed to be more restrictive by WEFA than by the OECD as witnessed by higher short-term interest rates forecasted by WEFA in both countries over the next five years. In particular, the Bundesbank is perceived to have been mostly concerned with exchange rate stabilization since the Louvre Accord was signed, and to have willingly forfeited, in pursuit of this objective, much of its room for maneuver in manipulating the interest rate with a view to affecting the level of domestic activity. On the other hand, OECD forecasters assume that the German monetary authorities will adopt a more pragmatic approach, shedding their traditional image as "sticklers for monetary orthodoxy at all costs" while not renouncing the objective of keeping monetary growth within the target range whenever feasible. This assumption, in turn, is predicated on the expectation that the policy will not place an unsustainable burden on domestic growth. For instance,

FIGURE 6


WEFA's LTIRs projections
U.S., Japan, & Germany
13
12
11
10
9
8
7
6
5
4
3
1987
1988
1989
1990
1991
1992
1987-1992
US
Japan
Germany


WEFA's STIRs projections
U.S., Japan, & Germany
9
8
7
6
5
4
3

short-term interest rates were lowered substantially in the aftermath of the stock market crash in mid-October in order to inject liquidity into the economy. However, unlike in the OECD forecasts, the WEFA forecasts show that the positive, long-term over short-term interest rate spread narrows over time in Japan but not in Germany.

As far as exchange rate developments are concerned,[1] the OECD, IECAP, Project LINK, and the WEFA Group all assume that the U.S. dollar will continue depreciating in their medium-term scenarios. However, in the WEFA forecasts, the U.S. dollar stops depreciating and begins undergoing a slight appreciation in 1990 vis-a-vis the DM, the lira and the yen. Project LINK comes in second after IECAP in anticipating the most severe dollar depreciation. LINK does not anticipate a turnaround in the dollar by 1991 as IECAP does, however.

In the OECD forecast, the depreciation of the U.S. dollar against the DM appears to be less marked than against the Japanese Yen, which is more than likely a reflection of the emerging feeling in Europe that the DM is undervalued within the EMS system This means that, to a large extent, the DM is sheltered by the EMS from the worst effects of a depreciating U.S. dollar.

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1. The OECD runs a simulation, given in the technical appendix to Economic Outlook 42, explicitly postulating a U S dollar depreciation over the course of the next five-to-six years.

With respect to the U.S. current account balance, the OECD assumes a falling deficit until 1989. In 1990 the deficit is expected to increase and will continue to do so until 1993. IECAP, Project LINK and WEFA all show a constantly falling U.S. deficit on the current account with no turning point in sight.[8]

The OECD shows the Japanese current account surplus diminishing through 1989 after which the surplus rises well into 1993. In the WEFA forecast, the Japanese surplus on the current account declines through 1992. Project LINK expects the Japanese surplus to decline through 1990, and then increase slightly. For Germany, the OECD predicts a falling current account surplus until 1990 with an increase beginning in 1991. The WEFA forecast shows the German current account surplus falling constantly, with the only exception being recorded in 1989, which shows a rise in the surplus over the previous year. Project LINK expects a small increase in Germany's current account surplus in 1989, followed by a fall to U.S. $36 billion by 1991. For Italy, the OECD postulates a more or less constantly growing deficit (with the only exception occurring in 1990). This is consistent with its anticipation of problems arising from the fact that the overall European current account surplus reduction, which constitutes the necessary counterpart to a falling US deficit will not be spread evenly among the European countries. Those countries which could afford the surplus reduction, such as West Germany, the Netherlands, and the Scandinavian countries, will bear by far the lighter share of the burden

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8/ IECAP projections for the U.S. current account balance currently extend only through 1989.

throughout the adjustment period.[9] WEFA projects a constantly improving current account balance for Italy, which in fact, moves into surplus in 1992. Project LINK's expected dollar depreciation vis-a-vis the Lira over the next five years is the most severe of all of the forecasts, and results in the smallest reduction in the Italian current account deficit.

The OECD estimates of the U.S. current account balance over the course of the next few years make sense in the context of a forecasting model which treats exchange rates as an exogenous variable (and holds them constant over the entire forecasting period), and where a declining deficit for three years in a row is accounted for by the well-known J-curve effects.[10] Given that the U.S. dollar has depreciated (and even under the assumption of a one-time, one-shot only, U.S. dollar depreciation), the effects of such depreciation would translate into a falling deficit for the U.S. only with a considerable time lag. At first, the U.S. current account deficit might even increase, although U.S. exports in volume terms would likely increase fairly quickly. The reversal in the trend, after the first three years of the forecasting period, is easily accounted for by the progressive wearing off of this effect.

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9/ This is based on WEFA's belief that the deutsche mark is undervalued in the EMS, along with those European currencies which move in line with the deutsche mark.

10/ Using the OECD medium-term baseline.

TABLE 3: Medium-Term Alternative Projections of Developments on the Current Account Balance of the G-3 Countries

(Billion US$ Levels)

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|
| United States | | | | | | |
| . OECD | -156.0 | -134.2 | -105.4 | -108.3 | -113.2 | -116.4 |
| . IECAP | -161.3 | -138.5 | -128.4 | - 91.3 | - 74.0 | - 50.0 |
| . WEFA | -156.1 | -142.4 | -146.4 | -137.6 | -137.0 | -129.6 |
| Japan | | | | | | |
| . OECD | 86.4 | 80.9 | 79.1 | 83.4 | 88.0 | 92.6 |
| . IECAP | 86.7 | 77.1 | 74.6 | 48.8 | 39.7 | 26.8 |
| . WEFA | 84.9 | 79.4 | 74.8 | 69.5 | 56.3 | 49.4 |
| Germany | | | | | | |
| . OECD | 44.0 | 40.5 | 32.2 | 31.0 | 32.1 | 33.8 |
| . IECAP | 44.2 | 42.0 | 41.5 | 25.0 | 20.3 | 13.7 |
| . WEFA | 39.5 | 39.0 | 40.0 | 32.1 | 22.4 | 23.3 |

NOTE: As IECAP's estimates for 1987, 1988 and 1989, we have used the latest WEO (March 2) figures.

Contrasting the WEFA view of a constantly falling U.S. deficit on the current account over the course of the entire projection period, the OECD assumes that the U.S. dollar depreciation to date has not been of a magnitude sufficient to increase the price-competitiveness of American goods in the home market vis-a-vis those of foreign suppliers. Therefore, if some adjustment in the direction of lower overall import bills for the U.S. occurs, it will come rather as the result of a shift away from high-cost suppliers and toward lower-cost ones, in the OECD forecasters' perceptions.

How does one explain what may, by some, be considered as an overcautious approach to forecasting on the part of IECAP? On the one hand, our latest forecasts were based on the assumption of a large further U.S. dollar depreciation over the next few years, but so were the most recent, post-market crash WEFA forecasts. The OECD projections were explicitly predicated on the assumption of unchanged exchange rate levels (as of November 10, 1987). IECAP's use of variable exchange rates over the entire projection period reflects: (1) a high degree of pessimism about the prospects of an imminent reemergence of a sound international monetary/financial system; and (2) the expectation of continued low levels of confidence on the part of investors resulting in relatively limited capital movements with a consequent loss of efficiency in terms of foregone opportunities for gain through foreign investment.

In addition, anticipated smaller injections of liquidity (lower prospects for liquidity growth) in the international economy, due to a sizeable scaling down in the foreseeable future of the U.S. current account

deficit (the counterpart of which is diminished confidence in the U.S. dollar as a reliable reserve currency), would already be sufficient to account for rather pessimistic forecasts of future real GNP growth in the OECD area as a whole.

IECAP's much gloomier views about the future growth prospects of the global economy may also be due to its skepticism over the future availability of funds destined for the LDC's from the multilateral organizations.

In contrast, Project LINK's forecasters' confident anticipation that GNP growth in the entire OECD area will pickup in 1991, is quite consistent with its projections of similar developments in the individual countries. This confidence is due, perhaps, to the LINK forecasters' belief that resumed faster growth in the U.S., made possible by a lifting of the external constraint, is the main locomotive which can pull the rest of the world from its low growth path. It is also indicative of the fact that, in general, LINK has singled out 1991 as the year most likely to constitute a turning point, if not a watershed in these forecasts.

Indeed, it is difficult to account for Project LINK's gloom with regard to prospects of buoyant U.S. GDP growth, given its seemingly firm belief in continued severe dollar depreciation, which, in turn, contributes to a fast disappearing surplus on the current account of Japan, and a marked worsening of the Italian deficit over the next few years. If the export performance of these two countries is expected to be dealt by far the heaviest blow by their currencies' constant appreciation vis-a-vis the

dollar, American exports will then most likely profit by this development, deriving a powerful boost, which will help contribute to resumed faster growth in the United States.[11] Alternatively, it is the capital account of these countries that will suffer most from the continued appreciation of their currencies, if interest rates do not rise by enough to yield a covered interest differential making it advantageous for investors to invest in these economies. Project LINK appears to subscribe to the latter view, at least in the case of Japan.

As it turns out, Project LINK's forecasters do, indeed, expect the growth rate of U.S. exports to exceed that of its imports, during the next five years, and thus to contribute positively to overall GNP growth in the United States. Where their optimism fails them is in their anticipation of a very modest growth rate of private, but also, public, consumption in the United States. In turn, U.S. total domestic consumption is perceived to drag until at least 1991. This will pull down an otherwise considerably higher overall GNP growth rate, by detracting from the invigorating stimulus to the economy due to constantly growing exports.

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11/ Although U.S. exports to Italy and Japan may not grow substantially, the U.S. should become more competitive in other markets.

## V. COMPARISION OF ALTERNATIVE BASELINES

### A. WEFA

The objective of this exercise is to, firstly, compare the Wharton and the World Bank baseline forecasts, with the latter derived from running the Wharton model using the World Bank's exogenous assumptions. In other words, Bank exchange rate and commodity price projections are imposed as exogenous variables in the Wharton model. Any differences between the Bank baseline forecast and the Wharton forecast could then be attributed to differences in the structures of the models.

Comparing the Bank forecast with the Bank baseline forecast using the Wharton model (WEFABANK), we can see that in the short run (1988 and 1989), GDP growth rates are quite a bit lower for the Bank forecast, whereas from 1990 to 1992, they are higher and in fact quite a bit higher in some instances for the Bank forecast (see Table 4). One plausible explanation for this pattern of GDP growth is that a greater wealth effect on growth is assumed in the Bank forecast. As a consequence, when the dollar depreciates further in 1988 and 1989, stock and bond prices will be expected to fall further, which will decrease the value of the private stock of wealth. Consumption and investment are in turn expected to decline, both of which will contribute to a steep decline in GDP growth. This market action also contributes greatly towards hastening the correction of the twin deficits. Therefore, the Bank projections show a greater decline in GDP growth in the short-run, but also an earlier correction of the deficit problem. As a result, real interest rates after

TABLE 4: WEFABANK Baseline[1]

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 3.6 | 2.2 | 1.4 | 1.6 | 0.8 |
| . Personal Consumption Deflator | 4.3 | 4.9 | 4.6 | 3.5 | 3.6 |
| . Unemployment Rate | 5.8 | 5.8 | 6.4 | 6.5 | 6.9 |
| . Current Account Balance | -140.9 | -132.1 | -121.1 | -126.0 | -135.4 |
| . Short-Term Interest Rate | 7.1 | 8.7 | 7.7 | 6.6 | 6.9 |
| . Effective Exchange Rate | - 15.7 | - 3.2 | 9.8 | 16.2 | 21.2 |
| Japan | | | | | |
| . Real GDP | 2.7 | 3.2 | 2.8 | 2.7 | 2.6 |
| . Personal Consumption Deflator | 1.0 | 2.8 | 2.6 | 3.1 | 5.0 |
| . Unemployment Rate | 3.4 | 3.5 | 3.5 | 3.3 | 3.2 |
| . Current Account Balance | 86.5 | 87.0 | 79.5 | 55.9 | 35.7 |
| . Short-Term Interest Rate | 3.4 | 3.7 | 4.1 | 4.8 | 5.1 |
| . Effective Exchange Rate | 4.9 | - 0.6 | - 0.5 | - 4.7 | - 9.5 |
| Germany | | | | | |
| . Real GDP | 1.2 | 1.5 | 3.5 | 4.0 | 4.7 |
| . Personal Consumption Deflator | 2.2 | 2.1 | 2.5 | 3.2 | 4.4 |
| . Unemployment Rate | 9.0 | 8.8 | 8.4 | 7.8 | 7.3 |
| . Current Account Balance | 48.1 | 48.2 | 31.5 | 16.4 | 9.9 |
| . Short-Term Interest Rate | 4.2 | 5.4 | 4.6 | 5.2 | 5.8 |
| . Effective Exchange Rate | 7.2 | 2.1 | - 4.3 | - 5.8 | - 7.1 |

1/ Results from the simulation of the Wharton World Model using The World Bank's exchange rate and commodity price projections.

1990 under the Bank forecast are quite a bit lower than those under WEFABANK due to the now much lower "crowding out" effect. Hence, investment and GDP growth are also higher under the Bank forecast than under WEFABANK for the period after 1990. In sum, the differences in the two forecasts may therefore be partly attributed to the differing assumptions about the short-run negative wealth effect on economic growth which in turn affects the speed with which the deficits are corrected and hence long-run interest rates and GDP growth rates.

Turning to the comparison of the Wharton forecast with the WEFABANK forecast, the major differences in assumptions are the exchange rate and commodity price paths. The World Bank and Wharton exchange rate forecasts show the same basic trend of a continued depreciation of the dollar with the dollar hitting a trough in 1989 and rebounding thereafter. The difference is that the trough under the Bank forecast is lower, and the rebound under the Bank forecast is also much higher, showing actually an "overshooting". Given this difference, the results obtained from running the Bank baseline scenario with the Wharton model are mostly as expected. Let us look first at the comparison of the forecasts for the United States.

Under the Bank scenario, the only year for which the forecast shows higher GDP growth than the Wharton scenario is 1988. This follows logically from the larger depreciation of the dollar in 1988 anticipated under the Bank scenario. This larger depreciation of the dollar occurs concurrently with lower short- and long-term nominal interest rates as well as lower real long-term rates in that year. In terms of effective exchange rate, the decline is much higher than under the Wharton scenario, -15.7

percent for the Bank compared with only -6.2 percent for Wharton. With a lower dollar exchange rate, exports enjoy higher, and imports lower growth, as expected, and the current account deficit improves a little. The lower interest rates also encourage investment, which shows a much higher growth rate under the Bank scenario (7.1 percent), compared to the Wharton growth rate of 4.4 percent. Private consumption is also higher in the Bank scenario due to the higher income, which is in turn generated from both higher investment and an improved trade balance. All these factors together, that is, the higher growth of consumption, investment and exports, and the lower growth of imports, therefore contribute to the higher GDP growth rate for 1988. The other variables also show the expected outcome, with the personal consumption deflator growing at a slightly higher rate (due to the lower exchange rate), and the unemployment rate declining and industrial production growth rate increasing due to the stimulus from higher GDP growth. Industrial production, aside from being directly affected by GDP growth, is also positively related to investment, which is itself growing and which also contributes to GDP growth. Net government borrowing is lower, which could be a result of both higher tax revenues due to the higher GDP growth, as well as lower interest rates which lower interest payments on the outstanding government debt.

Going on to 1989, the year in which the dollar exchange rate hits the low point, there is the surprising outcome of a slightly lower GDP growth rate compared with the Wharton model (in which the dollar exchange rate does not hit quite as low a trough). This is probably due to higher inflation (a result of a lower exchange rates) which lowers consumption growth, which in turn lowers GDP growth. Exports grow faster and imports

slower compared to the Wharton base case, in expected response to, again, the lower dollar exchange rate. The current account improves as a consequence, compared with the Wharton projection of a current account deterioration in 1989. An improvement in the current account is associated with a decrease in capital inflows, which leads to the increase in interest rates (both nominal and real) necessary to attract financing for the outstanding U.S. debt. This increase in interest rates over the Wharton baseline is in turn responsible for the lower growth in investment. With lower GDP and lower investment, industrial production is also lower. The unemployment rate is lower than that of Wharton's despite the slightly lower GDP growth compared to Wharton's because of the lagged effect of higher employment in the previous year.

From 1990 to 1992, as the Bank's dollar exchange rates appreciate by a much larger magnitude than those of Wharton, the results of the simulation, as expected, are that GDP growth would be lower than the Wharton projections. Interest rates are higher (the real interest rates are higher through that entire period, but the nominal short-term rate starts coming down in 1992), which lead to lower investment (in fact, investment growth is negative in 1992). Concurrent with the lower growth in GDP is lower consumption growth, which, with the multiplier effect, lowers GDP growth even further in comparison with the Wharton numbers. Industrial production, a function of both investment and GDP, slows down considerably in the entire period, growing at a lower rate compared to the Wharton scenario. The higher dollar appreciation in this period in comparison to the Wharton scenario also leads to the expected lower growth in exports and higher growth in imports. This results in a deterioration

in the current account, with the exception of 1990, when the current account improves despite worsened export volume growth and higher import volume growth; a result of the J-curve effect. In contrast, the Wharton current account balance actually improves from 1990 to 1992. This is in part due to the fact that the Wharton dollar appreciation is of a much smaller magnitude. as well as duration, compared with the Bank dollar forecasts. In fact, for some of the major currencies, the dollar begins to depreciate in 1992 in the Wharton forecast.

In the medium-term (1990-91), the WEFABANK inflation rates are the same as those of the Wharton forecast, despite lower economic activity and higher dollar exchange rates compared with the Wharton scenario. This is because of the lagged effect of higher inflation in the previous two years. From 1992 to 1994, the inflation rates are lower than those of Wharton in line with the lower level of economic activity and higher value of the dollar exchange rate forecasted, and also because the lagged effects of inflation from the earlier years have dissipated. In 1992, the nominal long- and short-term interest rates begin to grow at a slower rate than those in the Wharton scenario, probably because of the sustained lower levels of economic activity and inflation compared with the Wharton scenario.

Compared to the Wharton scenario, the lower dollar has also lowered the growth in imports though exports still grow at a lower rate compared to the Wharton scenario. This is probably due to the J-curve effect. As a result, there is a slight worsening of the current account balance despite the depreciation of the dollar.

So far we have discussed in detail the results for the U.S. economy of the simulation of the Wharton model using Bank baseline assumptions. Turning now briefly to the other major OECD economies, one would expect that the results for these economies of using Bank assumptions in the Wharton model should be more or less the mirror opposites of those for the U.S. economy. With the dollar depreciating to a new trough in 1989, the other currencies appreciate to a new height. This should result in a shrinkage of their GDP growth in the late 1980's. And when the dollar starts appreciating after 1989, one would expect these economies to grow faster. The German and the Italian economy seem to fall into this pattern, but it is not quite true for the Japanese economy.

German GDP growth does slow down in 1988 and 1989 compared to the Wharton growth rates as the deutsche mark appreciates against the dollar at a higher rate under the Bank scenario than under the Wharton scenario. And when the deutsche mark starts depreciating against the dollar after 1990, and at a steeper rate of decline compared with the Wharton model, the GDP growth rates overtake those of Wharton. Similar results are found for the Italian economy, with GDP growing at a lower rate in the 1988-90 period compared to the Wharton scenario as the lira appreciates at a higher rate against the dollar compared to the Wharton scenario. From 1991 onwards, as the Italian lira depreciates against the dollar at a higher rate than under the Wharton scenario, GDP growth rates surpass those of Wharton. The other economic variables for both the German and Italian economies follow logically the pattern of GDP growth.

The results are different, however, for the Japanese economy. First, movements in the yen effective exchange rate do not seem to synchronize with movements in the dollar exchange rate, at least not all the time. For instance, the dollar is expected to depreciate to a low trough in 1989, which should imply an appreciation of the yen that year. However, the yen effective exchange rate is actually depreciating in that year. On the other hand, after 1989, the yen effective exchange rate does move in the direction expected, that is, depreciate given the appreciation of the dollar in that period.

Movements in the yen exchange rate do not seem to generate the expected effects on trade either. A steeper depreciation of the yen throughout the 1989-92 period under the Bank scenario actually leads to lower export growth in comparison to the Wharton scenario, for all the years except 1989. This could be due to lower GDP growth in the U.S. during that period. On the other hand, it does lead to the expected lower growth in imports, except for 1989. Overall, the current account does not move in the direction expected. It registers a continued decline in the surplus despite continued depreciation of the yen, on top of registering a lower surplus than under the Wharton model even with the higher yen depreciation under the Bank scenario.

Japanese nominal interest rates seem to follow in general the movements of the exchange rate, that is, decrease as the yen depreciates, and vice-versa. The real interest rate also seems to move in the direction of the exchange rate, except for 1989, when it is higher than the Wharton number, due to a lower inflation rate. This lower inflation rate does not

concur with the yen depreciation of that year, although it could be due to the lagged effect of the previous year's low inflation rate. For the rest of the period, however, the inflation rates move in the correct direction, that is, they become higher given the depreciating yen.

The worsening trade balance under the Bank scenario probably contributes to the lower GDP growth rate, which in turn worsens the investment growth rate. In fact, investment growth does not follow the movement of interest rates; it is actually lower or stays the same despite the lower real interest rate in the period 1990-92. GDP growth probably has a stronger effect on investment than interest rates do. Given the lower GDP growth, consumption growth is also lower.

In all, it seems that the Japanese economy does not react in an expected fashion to assumptions under the Bank scenario. In particular, depreciation of the yen does not lead to improvement in its current account or higher GDP growth. This could be due to a combination of the following factors. First, Japanese exports to the U.S. could make up such a large percentage of U.S. imports that when the U.S. economy slows down during those years of dollar appreciation, the concurrent slow-down in U.S. exports could have a rather large constricting effect on Japanese export growth. Second, the J-curve effect for Japan could have a much longer time horizon.

B. OECD

Using IECAP's exchange rate projections and IECCM's commodity price projections, a World Bank-OECD baseline (OECDBANK) was developed. The following section describes the new baseline.

In comparing the IECAP forecast with the Bank baseline using the OECD model (OECDBANK), one quickly sees that while the IECAP forecast shows a near-term slow-down in economic growth in the U.S., followed by a modest recovery in the 1990s, the simulation results are quite the opposite. In fact, the OECDBANK results are quite startling. Real GNP in the U.S. grows by 2.9 percent in 1988, slightly higher than the consensus forecasts of 2.5 percent or so, and way above the IECAP forecast of 2.1 percent. One reason for this may be the expected 11 percent growth in export volume, compared to growth of less than one percent in imports. This leads to a fall in the U.S. current account deficit to U.S. $141 billion. Domestic demand grows slowly (1.1 percent), indicating that wealth effects from the October stock market crash do have an impact.

What is noteworthy about this forecast is that GNP growth remains moderately strong at 2.3 percent in 1989 and 1990, while other forecasts show these as being recessionary years. GNP seems to be driven by the external sector in 1989, while in 1990, there is no effect from the external sector. By 1990, the current account deficit has fallen to U.S. $72 billion.

## TABLE 5: OECDBANK Baseline[1]

(Percent Change)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . GNP | 2.9 | 2.3 | 1.7 | 0.7 | - 0.2 |
| . GNP Deflator | 3.2 | 4.6 | 5.2 | 4.5 | 2.8 |
| . Total Employment | 1.9 | 1.6 | 1.4 | 0.9 | 0.1 |
| . CAB (US$ Billion) | -140.5 | - 93.6 | - 71.7 | - 81.3 | -110.0 |
| . Short-Term Interest Rate | 5.65 | 5.70 | 5.53 | 5.63 | 5.47 |
| . Effective Exchange Rate | 0.905 | 0.876 | 0.956 | 1.096 | 1.300 |
| Germany | | | | | |
| . GNP | 1.4 | 0.8 | 1.1 | 2.3 | 4.7 |
| . GNP Deflator[2] | 0.9 | 0.0 | 0.7 | 2.2 | 4.9 |
| . Total Employment | 0.1 | - 0.2 | 0.0 | 0.8 | 2.0 |
| . CAB (US$ Billion) | 51.9 | 35.1 | 13.1 | 9.1 | 14.5 |
| . Short-Term Interest Rate[3] | 5.5 | 5.4 | 5.0 | 4.7 | 4.4 |
| . Effective Exchange Rate | N/A | N/A | N/A | N/A | N/A |
| Japan | | | | | |
| . GNP | 3.7 | 3.4 | 3.3 | 3.3 | 4.0 |
| . GNP Deflator | 0.64 | 1.1 | 1.4 | 2.8 | 4.6 |
| . Total Employment | 0.9 | 0.8 | 1.0 | 1.0 | 1.2 |
| . CAB (US$ Billion) | 92.4 | 95.3 | 86.0 | 73.8 | 66.9 |
| . Short-Term Interest Rate | 3.5 | 3.75 | 3.7 | 3.6 | 3.5 |
| . Effective Exchange Rate | 1.76 | 1.75 | 1.74 | 1.65 | 1.49 |

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1/ Results from the simulation of the OECD model using The World Bank's exchange rate and commodity price projections.
2/ Consumption Deflator
3/ Long-Term Interest Rate for Germany

After 1990, when other forecasts indicate that the U.S. will be recovering, OECDBANK indicates that matters will get much worse. In fact, from 1991-1993, growth is near zero. A great deal of this is due to the expected appreciation of the dollar in those years. In fact, the model results indicate that export growth will come to a halt, while imports grow substantially. Thus, one can see, Interlink is very sensitive to exchange rate movements.

For Germany, as one might expect, the forecast follows a similar, but opposite pattern as for the United States. The German economy grows well in 1988-89, starts to slow in 1990, reaches a nadir in 1991, and recovers slightly thereafter. This follows, as expected, the movement of the deutsche mark vis-a-vis the dollar.

There are several problems with the simulation results for Germany. Foremost among these is that consumer prices reach a rate of change of 4.9 percent in 1992 and 7.8 percent in 1993. Obviously, while possibly a consistent result, policy actions would be taken long in advance of reaching this stage. Therefore, this must be considered a strictly "hands-off" scenario.

In Japan, GNP growth remains relatively strong throughout the forecast period, although falling from a high of 4.3 percent growth in 1988 to a low of 2.4 percent in 1992. The declining rate of growth in 1988-90 is largely due to the appreciating yen, but the turnaround is not as quick for Japan as for other countries when the dollar rebounds.

In comparison with OECD's own medium-term baseline, OECDBANK is more optimistic for the U.S. for 1989-90, and much more pessimistic for the later years. This result is very much the same as in the comparison of OECDBANK with IECAP's forecast.

In fact, it is really not necessary to present a complete comparison of these two baselines. First, the comparison is very much the same as the comparison between OECDBANK and IECAP's forecast. Second, and more importantly, the overriding factor in the comparison is that OECDBANK includes a major dollar depreciation, followed by a strong rebound, while the OECD medium-term baseline follows constant real exchange rates. All results are intuitive from this difference.

C. LINK

This baseline scenario is derived by imposing World Bank exchange rates and commodity price forecasts on the LINK baseline (we will call this LINKBANK). While LINK forecasts a continued depreciation of the dollar through 1992, the World Bank forecasts a rebound of the dollar after it reaches a trough in 1989. The trough reached by the dollar in the World Bank case is also much lower than the dollar exchange rate for 1989 forecasted by LINK. Given these different exchange rate paths, the results of the simulation are somewhat surprising. GNP growth for LINKBANK in 1988 and 1989 is only slightly higher than that for the LINK baseline, despite a lower dollar forecasted by the Bank for those two years. In 1990, when the dollar starts appreciating in the Bank case while it continues to depreciate for LINK, the LINKBANK GNP growth is lower, as to be expected.

However, this lower GNP growth rebounds in 1991, and is only slightly lower than the LINK case and in fact overtakes the LINK case by 1992. These latter results are surprising given that the Bank dollar exchange rate continues to appreciate while the LINK rate continues to depreciate.

The relatively high GNP growth rates for 1991 and 1992 could in part be explained by the continued improvement in the trade balance even when the dollar begins its upturn. This could be due to the J-curve effect. This is borne out in particular by the pattern of nominal exports. Nominal exports decrease although real exports remain more or less the same. This is due to the decrease in the export price index, which in turn may be due to the fact that with the higher dollar, the prices of imported inputs go down, cutting the cost of production of the exportable goods and hence lowering the export price index. Where imports are concerned, the nominal value of imports goes down even though real imports actually increase. This implies that the import price index must be declining (which it is by quite a bit), due to the appreciating dollar. Since nominal imports decrease more than nominal exports, both the trade account and the current account improve.

The federal deficit decreases under the LINKBANK scenario in 1988, which may be attributable to the slightly higher GNP growth rate and hence slightly higher tax revenues which lower the federal deficit. This lower deficit continues into 1989, when interest rates also fall slightly. The lower interest rates are in turn attributable to the lower deficit and hence less "crowding out". By 1990, when GNP growth has slowed, interest rates and the deficit continue to fall, but for different reasons now.

## TABLE 6: LINKBANK Baseline[1]

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 2.5 | 1.4 | 1.2 | 3.1 | 3.2 |
| . Personal Consumption Deflator | 4.6 | 5.0 | 4.5 | 5.4 | 5.3 |
| . Unemployment Rate | 5.8 | 5.9 | 7.1 | 6.5 | 6.6 |
| . Current Account Balance | -129.2 | -105.1 | - 91.9 | - 84.3 | - 76.3 |
| . Short-Term Interest Rate | 6.2 | 7.4 | 6.7 | 6.6 | 6.6 |
| . Effective Exchange Rate | - 13.8 | - 2.9 | 7.1 | 12.4 | 12.6 |
| **Japan** | | | | | |
| . Real GDP | 4.6 | 3.2 | 3.8 | 4.3 | 4.9 |
| . Personal Consumption Deflator | 1.5 | 1.7 | 1.7 | 2.4 | 6.3 |
| . Unemployment Rate | 2.9 | 3.0 | 3.0 | 3.1 | 2.9 |
| . Current Account Balance | 81.1 | 79.7 | 81.5 | 87.8 | 117.2 |
| . Short-Term Interest Rate | 4.8 | 5.8 | 7.0 | 7.4 | 7.6 |
| . Effective Exchange Rate | - 15.6 | - 1.7 | 7.1 | 15.5 | 24.2 |
| **Germany** | | | | | |
| . Real GDP | - 0.2 | 1.8 | 5.5 | 5.8 | 4.5 |
| . Personal Consumption Deflator | 1.7 | 2.4 | 3.5 | 6.3 | 8.8 |
| . Unemployment Rate | 9.5 | 9.6 | 9.2 | 7.3 | 5.5 |
| . Current Account Balance | 41.4 | 43.1 | 34.3 | 42.0 | 31.3 |
| . Short-Term Interest Rate | 3.7 | 4.4 | 4.8 | 4.8 | 5.0 |
| . Effective Exchange Rate | - 21.1 | - 5.3 | 15.1 | 23.2 | 15.0 |

1/ Results from the simulation of Project LINK using The World Bank's exchange rate and commodity price projections.

Interest rates fall because of the lower investment demand due to lower GNP growth. This is borne out by the slight decrease in non-residential investment in 1990. As interest rates fall, interest payments on the outstanding federal debt fall, and hence the federal deficit decreases. This pattern of decreasing GNP growth, investment demand, interest rates, and federal deficits continues into 1991 and 1992, and at greater percentages, in particular for the last two variables. The rates of decrease in GNP growth and investment demand both level off after 1991.

The GNP deflator increases somewhat in 1988 and 1989, as GNP growth increases. The GNP deflator continues to be higher in 1990 and 1991, even though GNP growth is lower. This is probably because of the lagged effects of inflation. In 1992, the GNP deflator drops finally, after three consecutive years of slower GNP growth. On the other hand, the unemployment rate follows GNP growth, and is lower in 1988 and 1989 when GNP is higher, and higher in 1990-92 when GNP is lower.

Turning now to the Japanese economy, the GNP growth rate is actually higher all through the forecast period, though not by much in 1988 and 1989. This fits in with the yen exchange rate forecasts, whereby both LINK and the World Bank forecast a yen appreciation of quite similar magnitudes for the first two years, followed by a divergence afterwards with the World Bank forecasting a severe depreciation and LINK forecasting continued gradual appreciation. The percentage increase in GNP levels under the LINKBANK scenario compared to the LINK baseline gets progressively larger from 1990-92, which goes along with the increasingly larger depreciation of the yen under the LINKBANK scenario.

Most of this increase in GNP is attributable to the improvement in the trade account in that period, which goes along with the yen depreciation in the same period. As in the case for GNP, the improvement in the trade account gets progressively larger through the forecast period. With the higher GNP, consumption is also higher, although by a smaller percentage. The higher GNP also leads to higher private investment. Interest rates decline somewhat in 1989, possibly due to the lagged effect of the slightly higher yen appreciation in 1988. From 1990 to 1992, interest rates continue to increase, and at higher percentages, probably the result of progressively larger yen depreciation in that period. This rise in interest rates is also the proximate cause of the increasingly large decline in housing investment in the 1990-92 period. The decline in housing investment, however, is outweighed by increases in other types of private investment due to the increase in GNP so that total private investment is higher.

Inflation seems to follow the path of GNP, but with a lag. After three consecutive years of lower inflation starting in 1988, inflation starts to pick up in 1991 and continues through 1992. Finally, the unemployment rate seems to move in line with GNP; it drops all through the period, and at greater percentages as the increase in GNP grows larger.

As for the German economy, the differences in exchange rate forecasts between the World Bank and LINK are quite a bit more severe, and the outcome of the simulation shows the more marked effects of a deutsche mark appreciation in 1988-89 and depreciation in 1990-92. German GDP

decreases from the LINK baseline in the first period, in line with the deutsche mark appreciation, and it increases from the LINK baseline in the second period, in line with the deutsche mark depreciation.

The World Bank forecasts a much stronger appreciation of the deutsche mark in 1988-89 then LINK. And whereas LINK forecasts a much milder but sustained appreciation of the mark throughout the forecast period, the World Bank forecasts a rather sharp downturn of the mark after it reaches a peak in 1989. By 1991, the mark is at a much lower level under the Bank scenario than under the LINK scenario. Given these exchange rate forecasts, the LINKBANK outcome for the trade account for Germany is as expected. The trade balance worsens in 1988 and 1989 compared to the LINK baseline, and it improves over the LINK baseline in the remaining years. The current account follows more or less the same path. With this result for the trade account, GNP is higher than the LINK baseline in the first two years and lower in the remaining period. Private investment follows the same pattern as GNP, although housing investment follows the reverse pattern. This reverse pattern is also found for private consumption. This pattern for both private consumption and housing investment may be due to higher interest rates in the 1990-92 period, a result of the rather severe deutsche mark depreciation in that period.

The unemployment rate follows more or less the path of GNP, being higher than the baseline in the earlier years when GNP is lower, and lower than the baseline in the later years when GNP is higher. Finally, inflation seems to follow GNP with quite a lag, being lower than baseline for the entire forecast period except for 1988, when it is slightly higher.

We now turn finally to the Italian economy. While LINK forecasts a lira that appreciates somewhat in 1988 and 1989 and then remains stable thereafter, the Bank forecasts a lira that appreciates by a much larger magnitude in 1988 and 1989, and then depreciates by quite a bit thereafter. Again, given these exchange rate forecasts, the outcome of the simulation is as expected.

With the large appreciation of the lira in 1988 and 1989, GNP for those years is smaller. In fact, GNP in absolute terms is still lower than the LINK baseline in 1990, although the growth rate of GNP has rebounded for the LINKBANK scenario in that year. This is because the depression of GNP must have been quite severe in the first two years. After 1990, GNP rebounded, both in absolute terms and growth rates, in line with a rapidly depreciating lira.

Again, as in the case for Germany above, most of the effect on GNP is derived from the trade account, which responds in a manner close to what is expected. The trade account deteriorates in comparison with the LINK baseline all through the period 1988-91, even though the lira has already started to rebound in 1990. The outcome for the last year is due to the J-curve effect. The trade account improves relative to baseline in 1992, following the depreciation of the lira which has already started one year earlier. Movements in the current account balance follow quite closely those in the trade account, with the improvement actually beginning sooner, in 1991.

Private consumption is lower than the baseline for the years that GNP is lower than baseline, that is, 1988-90. Private investment falls in the first year, and is followed by such relatively slow growth all through the forecast period that in absolute terms it never catches up with the baseline level even in 1992. This is due to the lower GNP in the earlier years and probably also the lagged effects of lower GNP on investment. Interest rates follow a path that is expected given the path for exchange rates. Interest rates are lower than the baseline in 1988-90 when the lira is appreciating, and they are higher than the baseline in 1991-92 when the lira is depreciating. Investment demand does not therefore seem very sensitive to interest rates. Interestingly, while both the private consumption deflator and the private investment deflator follow the path of GNP, both being lower than the baseline when GNP is lower, and higher than the baseline when GNP is higher, the GNP deflator does not follow either and is higher in the period 1988-90, only to come down somewhat in 1991-92. Finally, the unemployment rate follows GNP closely, being higher in years when GNP is lower, and lower in years when GNP is higher.

## VI. IMPACT MULTIPLIERS[12]

Although the main focus in each of the simulations has been on the U.S., Germany, Japan, and to some extent, Italy, in each case the "rest of the world" has been solved endogenously. This allows for spill-over

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12/ The impact multiplier is defined as the percentage change in the growth rate of the variable in question, divided by the percentage change in the policy variable.

effects from each individual country to its trading partners, followed by feedback to the originating economy. The alternative simulations run with each model include a fiscal shock in the U.S., a fiscal shock in Japan, a monetary shock in the U.S., and a combination of all three. This section will focus on the impact multipliers inherent in each model, as evidenced by the results of the first three alternative simulations.

The main emphasis of this section will be on the specific model mechanisms involved, rather than on the feasibility or desirability of various changes in macroeconomic policy or their influence on the real world. We have already seen that Bank baselines using outside models yield predictable results. This section will examine the degree to which policy changes affect these outside models. For example, we know that a contractionary fiscal policy will have certain affects. This section will show whether those effects are equal across models.

In order to study impact multiplier effects, we will focus on four variables for three countries. They are real GNP/GDP, GNP/GDP deflator, investment, and the long- or short-term interest rate, depending on the model involved, for the U.S., Germany, and Japan. A table will show the impact multipliers for each scenario.

## A. WEFA

### 1. U.S. Monetary Ease

In this scenario, the U.S. discount rate was lowered (a one-time sustained shock) by 200 basis points in each year of the forecast, starting in 1988. Non-borrowed reserves were not increased to accommodate this shock. For the U.S. economy, the WEFA model indicates low sensitivity of real growth to changes in the money supply. Stimulation of the economy through a sustained lowering of the discount rate mainly increases leakages from the economy in the form of higher imports, and hence, deterioration of the current account. Real GDP growth increases only a little. There are, surprisingly, very little inflationary effects from monetary stimulation. The following is a more detailed discussion of the effects on the individual variables.

For the U.S., a sustained 200 basis point decline in the discount rate starting in 1988 lowers the short-term interest rate all through the forecast period, starting with a 1.2 percent decrease in 1988, with the magnitude of the decrease growing each year due to the own lagged effect of the short-term rate. Since the long-term interest rate is directly related to the short-term rate as well as to itself lagged one period, the long-term rate also decreases, and at growing magnitudes through the end of the period.

The decrease in long-term interest rates in turn spurs higher growth in investment. However, although the decline in interest rates is progressively larger over time, the trend of investment growth has the

reverse outcome. Simulation results show that the increase in investment growth is the smallest in 1988, largest in 1989, slightly lower in 1990, lower again in 1991 and higher in 1992 (see Table 7).

The pattern of percentage increase in GDP growth for each percentage decline in the discount rate follows that of the change in investment growth, being the low, -0.31 percent in 1988, dropping to -0.17 in 1989, then back up to -0.47 in 1990, -0.39 in 1991, and actually increasing to -0.41 in 1992.

The unemployment rate is improved somewhat throughout the forecast period, and in fact more so in the later years than in the earlier years, the result of lagged employment effects.

The current account balance deteriorates, increasingly so in the period 1988-91, with the deterioration becoming milder in the last two years of the forecast period. It therefore appears that the strongest effect on the current account occurs in the medium-term.

Monetary ease seems to have only very little effect on prices. In fact, the only significant impact is in the last two years of the forecast. Table 7 shows the percentage increase in the personal consumption deflator for each percentage decrease in the discount rate.

In sum, two distinct trends emerge from observations of the variables discussed above. First, for GDP, the effects of a sustained lowering of the discount rate seem to follow a slight cyclical path with

## TABLE 7: WEFA

### Impact Multipliers

### Easy Money[1]

| | Year 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|---|
| **Long-Term Interest Rate** | | | | | | |
| . United States | 0.18 | 0.33 | 0.46 | 0.66 | 0.81 | 0.49 |
| . Germany | 0.06 | 0.06 | 0.05 | 0.09 | 0.04 | 0.06 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.07 | 0.07 | 0.03 |
| **Investment** | | | | | | |
| . United States | - 0.64 | - 6.88 | - 2.80 | - 1.04 | - 3.27 | - 2.93 |
| . Germany | - 0.22 | - 0.14 | - 0.08 | - 0.11 | - 0.13 | - 0.14 |
| . Japan | 0.00 | - 0.08 | - 0.10 | - 0.09 | 0.00 | - 0.05 |
| **Private Consumption Deflator** | | | | | | |
| . United States | 0.00 | 0.00 | 0.00 | - 0.09 | - 0.09 | - 0.04 |
| . Germany | 0.00 | - 0.18 | 0.00 | 0.00 | - 0.07 | - 0.05 |
| . Japan | 0.00 | 0.14 | 0.00 | 0.00 | - 0.07 | 0.01 |
| **Real GNP/GDP** | | | | | | |
| . United States | - 0.31 | - 0.17 | - 0.47 | - 0.39 | - 0.41 | - 0.35 |
| . Germany | - 0.31 | - 0.25 | - 0.09 | - 0.16 | - 0.07 | - 0.18 |
| . Japan | - 0.14 | - 0.12 | - 0.24 | - 0.23 | - 0.13 | - 0.17 |

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1/ Lowering of the U.S. discount rate by 200 basis points for each year of the forecast.

the turnaround occurring in the second year of the shock. A large effect is felt in the first year, followed by a smaller one in the second year, recovering back up in the third, dropping in the fourth year, and finally, recovering again in the final year. Second, for unemployment, the current account balance, and inflation, the effects increase over the forecast horizon, and only start to come down either in the last or second to last year of the forecast period.

Under conditions of exogenously determined exchange rates, monetary ease in the U.S. has a stimulative effect on the German economy. In order to maintain fixed exchange rates, a lowering of the U.S. discount rate which in turn lowers U.S. interest rates has to be accompanied by a lowering of interest rates in Germany also.

The lowering of German interest rates in turn increases investment growth, by 0.22, 0.14, and 0.08 for each of the years 1988-90 and by an average of 0.12 for each of the years 1991-92 for each percentage decrease in the U.S. discount rate. Higher rates of investment growth lead to increases in real GDP growth, by 0.31, 0.25, and 0.09 for each of the years 1988-90, 0.16 in 1991, and 0.07 in 1992 for each percentage decrease in the U.S. discount rate. It seems, therefore, that the effects on GDP growth are quite similar to those on investment growth, both of which follow a trend of decreasing magnitude towards the end of the forecast period. In comparison with the effects of this shock on the U.S. economy, however, the effects on the German economy are considerably smaller.

With an increase in the GDP growth rate, the unemployment rate starts to decline after two years, with the decline greater at the end of the forecast period.

The personal consumption deflator in Germany, on the other hand, does not seem to be much affected by this U.S. policy shock. It does increase somewhat, by 0.18 for each percentage decrease in the U.S. discount rate for 1989 and by 0.07 in 1992. It remains unchanged for the other years.

Finally, the variable which seems to be most affected by the U.S. policy shock is the German current account, which improves slightly each year. Unlike the case for some of the other variables such as GDP, investment and unemployment, all of which improve more towards the end of the forecast period, the current account balance benefits the most towards the beginning of the period.

A monetary ease policy in the U.S. has a stimulative effect on the Japanese economy. With a lowering of the discount rates in the U.S., and in order to maintain exogenously determined exchange rates, Japanese interest rates will have to fall. However, Japanese interest rates do not start decreasing until 1990, and when they do, they decline at smaller magnitudes than in the case of Germany. Starting in 1990 and until 1992, the Japanese short-term rates decrease by 0.07 percent for each percentage decrease in the U.S. discount rate.

This decline in Japanese interest rates in turn increases investment growth in Japan, although not exactly in a one-to-one fashion. The increase in investment growth starts in 1989, before interest rate changes. This is probably because investment is also stimulated by GDP growth, which in turn is stimulated by higher exports as the U.S. economy engages in a monetary expansion policy. This conjecture is substantiated by the improvement in the current account balance all through the forecast period. The improvements in the current account balance increase over time, reaching a maximum in 1991. The magnitudes of the improvements are higher than they are for the German economy for the entire period, probably because the U.S. serves as a more important export market for the Japanese than it does for the Germans.

Both the increase in investment growth and the improvement in the trade account contribute to increases in GDP growth. These rates of change from the baseline are similar to those for Germany. However, unlike the case for Germany, the unemployment rates in Japan are not affected at all.

The Japanese personal consumption deflator is not much affected by this U.S. policy shock, as is the case for Germany. For half of the forecast period, there is no change at all. For 1989 the deflator changes by +0.14 for each percentage decrease in the U.S. discount rate, while in 1992, it changes by -0.07.

### ii. U.S. Tax Increase

The tax increase scenario is used to test the effect of a one-time sustained shock in fiscal policy in the United States. The tax increase begins in 1990, with a 10 percent increase in the average combined personal and corporate tax rates. For most of the variables, a tax increase simulation produces significant effects only in the first year of the shock, with the magnitude of the effects diminishing rapidly thereafter (see Table 8). The following is a discussion of each of the key variables.

The simulation results show that a sustained tax increase starting in 1990 does not have a large sustained effect on GDP growth. In terms of the percentage change in GDP growth for each percentage increase in the tax rate, simulation results show an initial decline of 5.71 percent in 1990, with recovery starting in 1991 at a much lower rate of 1.25 percent increase, and no change in 1992. This pattern of GDP change is reflected in investment growth, less so in consumption growth.

Investment growth shows a decline in the first year, followed by a recovery that takes on a slightly fluctuating path. These fluctuations are of a much smaller amplitude than the change in the first year, a pattern also exhibited by the changes in GDP growth rates. Consumption also suffers a bigger decline in 1990, followed by a recovery of a much smaller magnitude which eventually dwindles off.

Short-term interest rates decline slightly, by 0.01 percent for each percentage increase in the tax rate for each of the years 1990 and 1991, returning back to baseline thereafter. Although the magnitude of the

## TABLE 8: WEFA

### Impact Multipliers

### U.S. Tax Increase[1]

| Year | 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| **Long-Term Interest Rate** | | | | |
| . United States | - 0.35 | - 0.63 | - 0.86 | - 0.61 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | - 7.69 | 1.21 | -10.00 | - 5.49 |
| . Germany | - 0.48 | - 0.18 | - 0.20 | - 0.29 |
| . Japan | - 0.29 | - 0.29 | - 0.34 | - 0.31 |
| **Private Consumption Deflator** | | | | |
| . United States | 0.22 | - 0.57 | - 0.28 | - 0.21 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Real GNP/GDP** | | | | |
| . United States | - 5.71 | 1.25 | 0.00 | - 1.49 |
| . Germany | - 0.29 | 0.00 | - 0.21 | - 0.17 |
| . Japan | - 0.71 | - 0.37 | - 0.38 | - 0.49 |

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1/ A 10 percent increase in the average combined personal and corporate tax rates for the U.S. for each year of the forecast.

changes in interest rates is much smaller than that for the growth rates of GDP and its components, the pattern of changes is quite similar, with the greatest effects of the sustained shock occurring in the earlier years of the forecast period, and then dwindling down to zero thereafter.

The pattern of changes in the unemployment rates differ, however, from the patterns of changes in those variables discussed above, in the sense that relatively steady effects are felt all through the forecast period, without much fluctuation. The unemployment rate increases by a relatively small 0.02 percent for each percentage increase in the tax rate for each of the years 1990-92, and by 0.03 percent in 1993.

The personal consumption deflator shows fluctuating effects of relatively equal and small magnitudes all through the forecast period.

The current account exhibits the greatest effect of all in the first year, with a large increase of $8.2 billion. For the rest of the period, the increase in the current account balance declines substantially, and gets progressively smaller towards the end of the forecast period.

A U.S. tax shock has very minor effects on the German economy. From the table we can see that for most of the forecast period, there are no changes for most of the variables. In the instances where there are effects, they are of a magnitude of only 0.02 to 0.05 percent for each percentage increase in the U.S. tax rate. The only exception to this is the current account balance, which shows first a decrease of $0.5 billion in 1990, another decrease of $0.2 billion in 1991, then followed by a reversal of the decrease with an increase of $0.1 billion in year 1992.

In general, most of the effects on the Japanese economy are also due to effects on the external sector. In comparison with the German economy, these effects are of greater magnitude for the Japanese case. Again, this is probably due to the fact that the U.S. serves as a more important export market for the Japanese than it does for the Germans. Starting in 1990, when the shock first takes place, the Japanese current account deteriorates, and with a greater magnitude than in the German case. The size of this deterioration decreases over time through th nd of the forecast period, although it never reverses and goes back int a surplus as it does for Germany. As a result of this greater impact on the current account than in the German case, the Japanese GDP growth rates also experience changes of a greater magnitude for some years.

Neither the personal consumption deflator nor the unemployment rate are affected at all. The short-term interest rates change a little towards the end of the forecast period, by 0.01 percent in 1992 for each percentage increase in the U.S. tax rate.

### iii. Japanese Fiscal Expansion

This simulation involved an increase in Japanese public sector investment beginning in 1990 of a magnitude sufficient to maintain the proposed high levels of 1989. On the whole, a Japanese fiscal expansion simulation shows little effect on the U.S. economy (see Table 9). For example, the only year in which U.S. GDP growth is affected is 1992, when it declines 0.1 percent from the baseline. The only other variable which

TABLE 9: WEFA

Impact Multipliers

Japanese Fiscal Expansion[1]

| Year | 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| **Long-Term Interest Rate** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 1.12 | 0.69 | 0.00 | 0.60 |
| **Private Consumption Deflator** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | - 0.24 | - 0.13 | 0.00 | - 0.12 |
| **Real GNP/GDP** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.68 | 0.58 | 0.00 | 0.42 |

1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the years of the forecast.

is affected by the shock, and only for one year, is the current account balance, which increases by $0.1 billion in 1991. All the other variables remain unchanged for the entire forecast period.

Likewise, there are virtually no effects at all on the German economy in the case of a Japanese fiscal stimulus scenario.

As to be expected, the Japanese economy experiences effects of the greatest magnitude under this policy shock, more so than under the other policy scenarios, and more so than either the German or the U.S. economy under the same shock. However, the magnitudes of the changes per unit change in fiscal expenditures are relatively minor.

GDP growth increases throughout the forecast period, starting in 1990 when the policy is first implemented. The percentage increases in GDP growth for each percentage increase in fiscal expenditures are 0.68 percent and 0.58 percent for 1990 and 1991 (there is no increase above the baseline in fiscal expenditures in 1992). A lot of this increase is attributed to, obviously, the increase in investment growth. Consumption growth also increases with GDP growth. In all three cases, that is, GDP, investment and consumption, the effect is the largest in the earlier years of the shock, and dwindle off towards the end.

The changes in the current account balance are generally much smaller than those under the other two policy scenarios. This result seems to indicate that Japanese trade is less sensitive to domestic policy shocks than it is to U.S. policy shocks. As expected, an increase in government

investment which increases GDP growth also increases imports, and leads to a deterioration in the current account balance. Deterioration of the current account increases in the earlier years, and goes back down in the last year of the simulation.

Finally, the effects on the other variables are relatively minor, when they are present at all. The personal consumption deflator actually decreases, a curious outcome, although only by a very small magnitude. The percentage decline in this deflator for each percentage increase in fiscal expenditures is 0.24 percent in 1990 and 0.13 percent in 1991. There is no change at all in the unemployment rate despite the higher growth in investment and GDP. The short-term interest rate changes very little.

B. OECD

i. U.S. Monetary Ease

The impact of a 200 basis point exogenous decline[13] in the U.S. Treasury Bill rate for each year beginning in 1988 is felt most strongly by the real side of the economy in 1989, but by the financial variables not until 1992. In the U.S., this translates directly into a 200 basis point decline in short-term interest rates. Long-term rates, however, decline by much less. In fact, the long-term interest rate falls by only 18 percent of the change in the short-term rate in the first year, increasing to 58.3 percent of the change by 1991.

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13/ This translates into, roughly, a 36 percent decline in the three month Treasury Bill rate.

The fall in long-term interest rates leads to a large increase in real investment growth, especially in the second year, when the change in the investment growth rate for each percentage point change in the Treasury Bill rate equals -1.15. Investment increases in 1992 by the largest amount (10.3) for each percentage change in interest rates.

The pattern of increase in GDP growth for each percentage decline in the short-term interest rate follows a similar pattern. The change in GDP growth is the largest in the second year, but then tails off towards the end of the forecast period. Inflation follows a different path, with the magnitude of the impact growing each year, so that by 1992, inflation is nearly doubled.

The pattern which emerges from this exercise is similar to that from the WEFA runs. Investment and GDP growth are affected in a cyclical pattern with the second year receiving the greatest effect for GDP and the last year having the largest impact on investment. The direct effect on financial variables, however, such as the long-term interest rate and inflation build in magnitude throughout the forecast period.

With exogenously determined exchange rates, the monetary expansion in the U.S. has a slightly stimulative effect on the German economy in the later years. Although one would expect that German interest rates would fall in order to maintain the predetermined exchange rates, this is not the case. The monetary expansion in the U.S. has no impact on German interest rates. In fact, the only feedback to the German economy is through changes in exports and imports.

The effect of the interest rate shock is felt only slightly more in Japan. Again, interest rates in Japan show no movement. The major impact is due to increased exports from Japan to the United States. This will be discussed later in the section on alternative simulations.

Impact multipliers are shown for this scenario in Table 10.

ii. U.S. Tax Increase

The 10 percent sustained increase in personal taxes tests the impact of a fiscal policy shock on the model. The impact is felt immediately on GDP, where the growth rate falls by 82.4 percent in 1988 yielding an impact multiplier of 8.24. The effect on GDP is less pronounced in later years.

The impact on the price level is the opposite, with a small impact in the early years building to a 111 percent decrease (impact multiplier of 11.11) in the rate of inflation. Impact multipliers for the U.S., Germany, and Japan are shown in Table 11.

In this simulation, it is the growth rate of employment which behaves in a cyclical manner. The effect of the tax increase on employment is strongest in the second year, and, in fact, is double the impact felt in both the first and third years.

Investment is particularly hard hit in this simulation, with negative rates of growth for all three years. This is in large part responsible for the worsening of domestic demand, which falls by a greater

## TABLE 10: OECD

### Impact Multipliers

### Easy Money[1]

| | Year | 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|---|---|
| Long-Term Interest Rate | | | | | | | |
| . United States | | 0.18 | 0.35 | 0.47 | 0.58 | 0.56 | 0.43 |
| . Germany | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Investment | | | | | | | |
| . United States | | - 1.15 | - 4.12 | - 2.53 | - 1.84 | -10.27 | - 3.98 |
| . Germany | | 0.14 | - 0.29 | - 0.28 | - 0.30 | - 0.07 | - 0.16 |
| . Japan | | - 0.05 | - 0.17 | - 0.08 | - 0.08 | - 0.06 | - 0.09 |
| Private Consumption Deflator | | | | | | | |
| . United States | | - 0.07 | - 0.28 | - 0.59 | - 0.94 | - 2.28 | - 0.83 |
| . Germany | | 0.31 | 0.00 | 0.00 | - 0.13 | - 0.11 | 0.01 |
| . Japan | | 0.00 | 0.00 | - 0.15 | - 0.16 | - 0.09 | - 0.08 |
| Real GNP/GDP | | | | | | | |
| . United States | | - 0.19 | - 0.74 | - 0.49 | - 0.40 | 0.00 | - 0.36 |
| . Germany | | 0.00 | 0.00 | - 0.25 | - 0.12 | - 0.06 | - 0.09 |
| . Japan | | - 0.08 | - 0.08 | - 0.17 | - 0.09 | - 0.07 | - 0.10 |

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1/ Lowering the U.S. Treasury Bill rate by 200 basis points for each year of the forecast.

## TABLE 11: OECD

### Impact Multipliers

### U.S. Tax Increase[1]

| Year | 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| **Long-Term Interest Rate** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | -13.91 | -21.30 | -72.50 | -35.90 |
| . Germany | - 1.00 | - 2.11 | - 0.98 | - 1.36 |
| . Japan | 0.00 | - 1.05 | - 0.49 | - 0.51 |
| **Private Consumption Deflator** | | | | |
| . United States | - 0.64 | - 3.89 | -11.11 | - 5.21 |
| . Germany | 0.00 | - 0.46 | - 0.41 | - 0.29 |
| . Japan | 0.56 | 0.29 | - 0.17 | 0.23 |
| **Real GNP/GDP** | | | | |
| . United States | - 8.24 | -18.57 | -25.00 | -17.27 |
| . Germany | - 1.82 | - 1.74 | - 0.64 | - 1.40 |
| . Japan | - 0.61 | - 1.52 | - 1.50 | - 1.21 |

---

1/ A 10 percent increase in the U.S. personal tax rate for each year of the forecast.

degree than does GDP. It is not clear what is causing this drop in investment although it is probably due to the lower levels of GDP growth which may affect business confidence. As one would expect, the tax increase has a dramatic effect on the government budget deficit in the first year, although the recessionary effects of the tax increase work to offset this improvement in later years.

The tax increase in the U.S. has little effect on Germany, causing some cyclical movement in GDP. This is due, most probably, to lower exports to the U.S. due to the recession there. The slower growth in Germany leads to a worsening of the government budgetary position.

In Japan, the effects are similar, although the changes in GDP are not cyclical in nature. Rather, GDP worsens further in every year, and whereas Germany experiences lower inflation due to the slow-down in growth, Japan actually experiences several years of higher inflation.

### iii. Japanese Fiscal Stimulus

As one would expect, the most significant impact of a Japanese fiscal shock is felt in the Japanese economy, followed by the U.S., with Germany experiencing very little effect. In fact, in the U.S., most of the effects are due to changes in trade and are reflected primarily in a fall in the current account deficit. GDP improves by 29 percent in 1991, but this is largely due to higher exports, since domestic demand only increases by 5.9 percent.

Of this increase in domestic demand, the largest impact is due to an unexplained increase in investment. This increase may be due to producers of exportable goods increasing their productive capacity.

For each percentage point increase in Japanese public sector investment, U.S. investment grows by 0.28 percent in the first year and 0.34 percent in the second year. Investment doubles over the baseline figure in the third year, but this is due to lagged effects since the fiscal expansion ends in 1991.

The Japanese expansion is somewhat inflationary for the U.S., causing an 11.1 percent increase in inflation in the final year of the forecast.

German investment also increases due to the Japanese expansion. Total investment in Germany increases by 0.41 percent in the second year for every percentage point increase in Japanese investment. This results in a slight expansion (4.3 percent) in German GDP in the second and third year of the shock. Inflation increases by 2 percent.

The real effect of the Japanese expansion is, of course, on the Japanese economy. The immediate impact of an increase in government expenditure should be to raise, ex ante, demand through the standard income-expenditure relationships and, allowing for leakages, should put upward pressure on imports. There are several points concerning the effect of the shock which are noteworthy. First, the shock is deflationary in the first two years. Inflation is 22.2 percent lower in the first year and

17.1 percent lower in the second year. This is very unusual, since one would expect the higher level of government spending to be inflationary. In fact, looking at the GDP figures, one sees that the economy is heating up very quickly. The GDP impact multiplier for a change in government spending is 2.5 in the first year and 4.8 in the second year. This translates into a tripling of the GDP growth rate by 1991.

Table 12 shows the impact multipliers for the U.S., Germany, and Japan for this simulation.

Several conclusions may be reached from this exercise. First, the cross-country linkages are not very strong except in terms of trade. The financial variables are not affected substantially by changes in other countries. However, output is generally affected, but mostly due to changes in exports and imports. There is very little cross-country effect on domestic demand.

Second, several of the impact multipliers are quite large, especially for one or two years of the simulation. The GDP/Tax Rate multiplier for the U.S. averages -17.3 for the entire period. The Investment/Tax Rate multiplier for the U.S. averages 35.9. Other large impact multipliers include the GDP/government investment multiplier for Japan.

Third, investment seems to react, at times counterintuitively, and at best, by magnitudes which seem incredible. This may be due to the impact of real household disposable income on investment in housing, which, acting at times in concert with the interest rate effect, causes major swings in total investment.

## TABLE 12: OECD

### Impact Multipliers

### Japanese Fiscal Expansion[1]

| | Year | 1 | 2 | Mean |
|---|---|---|---|---|
| **Long-Term Interest Rate** | | | | |
| . United States | | 0.00 | 0.00 | 0.00 |
| . Germany | | 0.00 | 0.00 | 0.00 |
| . Japan | | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | | 0.28 | 0.34 | 0.31 |
| . Germany | | 0.00 | 0.41 | 0.21 |
| . Japan | | 8.09 | 11.89 | 9.99 |
| **Private Consumption Deflator** | | | | |
| . United States | | 0.00 | 0.00 | 0.00 |
| . Germany | | 0.00 | 0.00 | 0.00 |
| . Japan | | - 1.41 | - 0.67 | - 1.04 |
| **Real GNP/GDP** | | | | |
| . United States | | 0.00 | 1.11 | 0.56 |
| . Germany | | 0.00 | 0.17 | 0.09 |
| . Japan | | 2.50 | 4.83 | 3.67 |

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1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the years of the forecast.

## C. LINK

### 1. U.S. Monetary Ease

In order to reduce interest rates substantially in the Project LINK model, which uses for its U.S. model the Wharton Quarterly model, it was necessary to lower the Federal Funds rate by 250 basis points, rather than the 200 basis points used in simulating the Wharton World Model or the OECD Interlink model. The strongest effect is felt on the economy in the second and third year of the shock, both for the real side of the economy and for the financial variables. The sustained shock to the Federal Funds rate lowers the Treasury Bill rate for the U.S. by about 200 basis points in each year of the simulation. Long-term rates fall by quite a bit less.

The fall in long-term rates, however, leads to a large increase in the growth rate of investment, especially in the third year of the simulation (see Table 13), when the change in the investment growth rate for each percentage change in the Federal Funds rate equals forty-four percent. By 1992, the effect drops off to near zero.

The pattern of change in the GDP growth rate is quite cyclical in nature. The GDP growth rate increases by the largest amount in the second year, but after falling to a factor of only 0.09 for each percentage point fall in the Federal Funds rate in the fourth year of the simulation, the effect doubles in the following year. The decline in interest rates has very little impact on the rate of inflation, with whatever marginal effect there is coming in the second year of the shock.

## TABLE 13: Project LINK

### Impact Multipliers

### Easy Money[1]

| | Year | 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|---|---|
| **Short-Term Interest Rate** | | | | | | | |
| . United States | | 0.92 | 0.89 | 0.88 | 0.85 | 0.88 | 0.88 |
| . Germany | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | | | | |
| . United States | | - 0.32 | - 5.87 | -44.25 | - 2.56 | 0.01 | -10.60 |
| . Germany | | 0.00 | 0.00 | 0.10 | 0.07 | 0.16 | 0.07 |
| . Japan | | 0.00 | 0.00 | - 0.05 | 0.00 | 0.00 | - 0.01 |
| **Private Consumption Deflator** | | | | | | | |
| . United States | | 0.00 | - 0.07 | 0.00 | 0.00 | 0.00 | - 0.01 |
| . Germany | | 0.00 | 0.00 | 0.08 | 0.04 | 0.07 | 0.04 |
| . Japan | | 0.00 | 0.00 | 0.00 | - 0.15 | 0.00 | - 0.03 |
| **Real GNP/GDP** | | | | | | | |
| . United States | | - 0.11 | - 0.48 | - 0.24 | - 0.09 | - 0.18 | - 0.22 |
| . Germany | | 1.42 | 0.56 | 0.05 | 0.05 | 0.00 | 0.42 |
| . Japan | | 0.00 | 0.00 | - 0.08 | - 0.06 | - 0.06 | - 0.04 |

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1/ Lowering of the U.S. federal funds rate by 250 basis points for each year of the forecast.

With exogenously determined exchange rates, the monetary expansion in the U.S. has a contractionary effect on the German economy. Most of this effect is seen in the first two years, with an average change of 1.0 in German GDP for each percentage point change in the U.S. Federal Funds rate. As in the Interlink simulations, the monetary expansion does not have the expected effect of lowering German interest rates. In fact, there is no change in German interest rates at all.

The effect of the interest rate shock is felt only slightly in Japan. Interest rates show no movement. The GDP growth rate increases slightly in the final three years of the simulation.

ii. U.S. Tax Increase

The ten percent increase in the personal tax rate in the U.S. tests the impact of fiscal policy shocks on the model. The effect is immediate on investment and GDP in the United States. Investment growth declines by 300 percent in the first year and 15 percent in the second year, yielding impact multipliers of -30.0 and -1.54 respectively. The impact multiplier for GDP is less dramatic, at -2.5 in the first year and - 0.65 in the second year.

The price level does not change due to the tax increase, while interest rates fall slightly.

There is no cyclical pattern to the effects of the fiscal shock. The impacts are felt most strongly on all variables, except interest rates, in the first year, with the effect halved in the second year, and falling off to near zero in the third year.

The tax increase causes a decline in the rate of growth of GDP and investment in Germany, although the magnitude of the change is not very large. The impact on GDP is most likely due to the economic slow-down in the U.S., which causes lower export growth in Germany. The decline in GDP growth rates leads to lower levels of expectation for economic growth in Germany, which translates into lower levels of investment growth.

In Japan, like in Germany, there is no effect in the first year of the shock. Unlike in Germany, where the impact is most pronounced in the third year (see Table 14), in Japan, the impact is greatest in the second year.

iii. Japanese Fiscal Stimulus

As one would expect, the largest impact of the Japanese expansion is felt on the Japanese economy. In fact, there is no significant effect, using the Project LINK model, on either the United States or Germany.

Even in Japan, the impact is much less than in either the Wharton World Model or the Interlink model. As one can see from Table 15, the impact multiplier for GDP averages about 0.17 in the first two years. The effect on investment is even less, with an average impact multiplier of 0.12 in the first two years. There is no impact on interest rates, while inflation increases only in the second year.

TABLE 14: Project LINK

Impact Multipliers

U.S. Tax Increase[1]

| Year | 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| **Short-Term Interest Rate** | | | | |
| . United States | - 0.11 | - 0.22 | - 0.24 | - 0.19 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | -30.00 | - 1.54 | - 0.63 | -10.72 |
| . Germany | - 0.17 | - 0.14 | - 0.27 | - 0.19 |
| . Japan | 0.00 | - 0.16 | - 0.17 | - 0.11 |
| **Private Consumption Deflator** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Real GNP/GDP** | | | | |
| . United States | - 2.50 | - 0.65 | 0.00 | - 1.05 |
| . Germany | 0.00 | - 0.17 | - 0.22 | - 0.13 |
| . Japan | 0.00 | - 0.23 | - 0.20 | - 0.14 |

1/ A 10 percent increase in the U.S. personal tax rate for each year of the forecast.

## TABLE 15: Project LINK

### Impact Multipliers

### Japanese Fiscal Stimulus[1]

| Year | 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| **Short-Term Interest Rate** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | - 0.11 | 0.00 | 0.00 | - 0.04 |
| . Japan | 0.11 | 0.12 | 0.00 | 0.08 |
| **Private Consumption Deflator** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.00 | 0.21 | 0.00 | 0.07 |
| **Real GNP/GDP** | | | | |
| . United States | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.16 | 0.18 | 0.00 | 0.12 |

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1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the years of the forecast.

D. Summary

Table 16 shows a comparison of the average impact multipliers for the three models for each of the three scenarios. It is difficult to draw any significant conclusions from these multipliers; however, that in itself is significant. One cannot even make a broad statement as to which models have similar impact multipliers, for this changes according to which country one is discussing, which variable, and for which scenario.

This leads us to one significant result. As a first step, we have run each of the models using our assumptions for exchange rates and commodity prices. This closed the gap between our forecast and the forecasts of the other groups. Then we ran this multiplier test to try to determine why other differences still occur in the forecasts. The answer to this is that the impact of fiscal and monetary shock variables differs a great deal from model to model. While impact multipliers are not explicit in the IECAP forecast, one would expect that the implicit multipliers would vary from these other models also.

Therefore, one must conclude that while the differences between the baseline forecasts using the outside models and IECAP's own baseline forecast are due to the way each model handles the change in exchange rates and commodity prices, the group whose baseline is closest to IECAP's is likely to be the one with similar impact multipliers.[14]

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14/ As a topic for future research, it would be enlightening to run each model shocking just the exchange rates to see what the impact is.

TABLE 16: Average Impact Multipliers

| | Easy Money Scenario | | | U.S. Tax Increase | | | Japanese Expansion | | |
|---|---|---|---|---|---|---|---|---|---|
| | WEFA | OECD | LINK | WEFA | OECD | LINK | WEFA | OECD | LINK |
| **Interest Rates** | | | | | | | | | |
| . United States | 0.49 | 0.43 | 0.88 | - 0.61 | 0.00 | - 0.19 | 0.00 | 0.00 | 0.00 |
| . Germany | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 00 |
| . Japan | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Investment** | | | | | | | | | |
| . United States | 2.93 | - 3.98 | -10.60 | - 5.49 | -35.90 | -10.72 | 0.00 | 0.31 | 0.00 |
| . Germany | - 0.14 | - 0.16 | 0.07 | - 0.29 | - 1.36 | - 0.19 | 0.00 | 0.21 | - 0.04 |
| . Japan | - 0.15 | - 0.09 | - 0.01 | - 0.31 | - 0.51 | - 0.11 | 0.60 | 9.99 | 0 08 |
| **Private Consumption Deflator** | | | | | | | | | |
| . United States | - 0.04 | - 0.83 | - 0.01 | - 0.21 | - 5.21 | 0.00 | 0.00 | 0.00 | 0.00 |
| . Germany | - 0.05 | 0.01 | 0.04 | 0.00 | - 0.29 | 0.00 | 0.00 | 0.00 | 0.00 |
| . Japan | 0.01 | - 0.08 | - 0.03 | 0.00 | 0.23 | 0.00 | - 0.12 | - 1.04 | 0.07 |
| **Real GNP/GDP** | | | | | | | | | |
| . United States | - 0.35 | - 0.36 | - 0.22 | - 1.49 | -17.27 | - 1.05 | 0.00 | 0.56 | 0.00 |
| . Germany | - 0.18 | - 0.09 | 0.42 | - 0.17 | - 1.40 | - 0.13 | 0.00 | 0.09 | 0.00 |
| . Japan | - 0.17 | - 0.10 | - 0.04 | - 0.49 | - 1.21 | - 0.14 | 0.42 | 3.67 | 0.12 |

## VII. ALTERNATIVE SCENARIOS

### A. WEFA

Alternative Bank scenarios were derived from the Wharton model based on Bank baseline assumptions (that is, the aforementioned exchange rate and commodity price forecasts). These alternative scenarios include: (i) monetary ease, through the lowering of the U.S. discount rate by two percentage points per year beginning in 1988; (ii) U.S. fiscal deficit correction through an increase in the average tax rate by 10 percent beginning in 1990; (iii) Japanese fiscal stimulus, through an increase in public investment starting in 1990; and finally (iv) the combination of the above three scenarios.

Due to the idiosyncrasies of the model, certain constraints were encountered during the implementation of some of these scenarios. First, as far as monetary ease is concerned, the original intention was to impose both a lower discount rate and a higher level of unborrowed reserves. This was relinquished in favor of just the first change because the Wharton model lacks a distinction between borrowed and unborrowed reserves for its domestic reserves category. Second, our intention was to raise taxes only on personal income and not on corporate income as well. This was relinquished because the Wharton model only allows for changes in an average tax rate which applies to both the personal and corporate sectors.

i. U.S. Monetary Ease

The U.S. monetary ease scenario is one in which the discount rate is lowered by two percentage points beginning in 1988. All other exogenous variables are held to be the same as before. The objective of such a policy would be to avert a recession in the U.S. economy as the economy adjusts to correct the twin deficits. The monetary ease scenario is run with the Bank baseline assumptions, and the results are compared with the results of the Bank baseline scenario.

With a lowering of the discount rate, interest rates fall (nominal and real, short- and long-term). As expected, investment growth is higher in comparison with the baseline, for all the years except 1994. For most of the years in the forecast period, GDP growth increases, but not by much over the baseline. GDP growth is actually slightly lower in 1992. It appears that much of the monetary ease has gone to stimulating the external sector. Although both export and import volume growth are higher than the baseline, the current account deficit worsens. It would appear that the increase in investment which results from monetary ease is not sufficient to raise GDP growth by any significant amount as the trade balance probably worsens at the same time. Private consumption growth either remains at the same rate or increases only slightly, given the very small changes in GDP growth. Contrary to what one might expect, inflation does not increase significantly at all. In fact, the personal consumption deflator either remains at the same level, or increases only very slightly (see Table 17). This fits into the picture above since GDP growth does not pick up significantly in order to create an excessive demand situation which might

## TABLE 17: WEFA

### Monetary Ease Simulation[1]

### (Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.3 | 0.1 | 0.2 | 0.2 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| . Unemployment Rate | - 0.1 | - 0.1 | - 0.2 | - 0.4 | - 0.4 |
| . Current Account Balance | - 2.2 | - 2.4 | - 3.4 | - 4.2 | - 2.5 |
| . Short-Term Interest Rate | - 1.2 | - 1.7 | - 2.0 | - 2.1 | - 2.2 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Japan | | | | | |
| . Real GDP | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 |
| . Personal Consumption Deflator | 0.0 | - 0.1 | 0.0 | 0.0 | 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.8 | 1.0 | 1.4 | 1.5 | 1.0 |
| . Short-Term Interest Rate | 0.0 | 0.0 | - 0.1 | - 0.1 | - 0.1 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | - 0.1 | - 0.1 | - 0.1 |
| . Current Account Balance | 0.3 | 0.4 | 0.3 | 0.2 | 0.1 |
| . Short-Term Interest Rate | - 0.3 | - 0.3 | - 0.2 | - 0.1 | - 0.2 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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1/ Lowering of the U.S. discount rate by 200 basis points for each year of the forecast, starting in 1988.

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be inflationary. The unemployment rate declines, and the growth in industrial production increases, in line with the slightly higher GDP growth. Net government borrowing as a percentage of GDP decreases slightly, which could be a result of both higher tax revenues due to higher GDP growth, as well as lower interest payments due to the lower interest rates.

We turn now to the effect on the German economy of a U.S. monetary ease policy. Given that exchange rates remain unchanged (exogenous), lower interest rates in the U.S. imply lower interest rates in Germany, for otherwise there would be capital flow from the U.S. to Germany which would cause the deutsche mark to appreciate. (This would be a scenario in which the German government, in order to maintain the same level of exchange rates as before, would also engage in a monetary ease policy in the face of such a policy in the U.S.) The decline in interest rates in Germany, however, is small compared to that in the United States. Lower German interest rates lead to higher growth in investment, but again of a magnitude much smaller than that in the United States. As a result, German GDP growth is also higher. Given the higher GDP growth, import volume growth increases. However, export volume growth also increases, which could in part be due to higher GDP growth in the U.S. and hence higher import demand by the United States. Unlike the case for the U.S., in which the current account balance deteriorates, the German current account improves. This may be due to differences in import demand elasticities between the two countries. The effect on German inflation is very small, with the personal consumption deflator either remaining at the same level as previously, or increasing by at most 0.1 percentage points. And with

the slightly higher growth in GDP, the unemployment rate declines slightly and industrial production growth increases slightly. Net government borrowing decreases slightly in the later years, due to higher tax revenues resulting from higher GDP growth, and lower interest payments resulting from the lower interest rates.

Turning now to the Japanese economy, we see that the results are somewhat similar to those for the German economy. With lower interest rates in the U.S. and no changes in the exchange rate, Japanese interest rates decline by an even smaller magnitude than in Germany, and in fact remain unchanged for some years. This could be due to the fact that the Japanese economy is relatively insular to capital flows. The slightly lower interest rates lead to slightly higher growth in investment for some of the years, which in turn leads to slightly higher growth in GDP for nearly all the years. Again, as in the case for Germany, both export and import volume growth increases, due respectively to higher import demand overseas and higher GDP growth domestically. The current account balance improves somewhat.

ii. U.S. Tax Increase

This is a scenario designed to have the U.S. budget in balance by 1994. As expected with a tax increase, net government borrowing as a percentage of GDP decreases, starting with a large decrease in 1990 and followed by gradual decreases through the end of the forecast period. Since the tax increase originates in 1990, and since it is the average tax rate (composed of both personal and corporate taxes) which is increased,

both consumption and investment fall that year. As a result, GDP growth falls substantially in 1990, leading to a large decline in import volume growth and the consequence that the current account balance improves. Export volume growth also declines a little in 1990, probably because of lower productive capacity, though not to the extent that import volume growth has fallen. The growth rates for most of the variables rebound in 1991, although of course, in level terms they are lower. The exception is long-term interest rates, both real and nominal, which are lower throughout the entire forecast period, a consequence of the lower borrowing requirements of the government and therefore the easing of "crowding out". This would probably explain the rebounding of the investment growth rate and of the GDP growth rate, and, consequently, the consumption growth rate. The import growth rate also rebounds after the initial large decrease, with the export growth rate remaining more or less the same as before. As a result, the current account balance worsens again after the initial large improvement, though in level terms it still shows an improvement by the end of the forecast period.

The effect of a tax increase in the U.S. on the Japanese economy is such that the GDP growth rate declines somewhat in 1990 through 1992 (see Table 18). The major contributing factor to this decline is lower growth of total exports in the years 1990-92, with the decrease being especially severe in 1990. This is, of course, a result of the contraction of import demand by the U.S. under the higher tax regime. With a lower GDP growth rate, Japanese import growth also slows down, though not to the extent of the decline in its export growth rates. As a result, the current account balance deteriorates in the 1990-92 period, though not by much.

## TABLE 18: WEFA

### U.S Tax Increase[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.8 | 0.2 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.1 | - 0.2 | - 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 |
| . Current Account Balance | 0.0 | 0.0 | 8.2 | 2.0 | 1.4 |
| . Short-Term Interest Rate | 0.0 | 0.0 | - 0.1 | - 0.1 | 0.0 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Japan** | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.2 | - 0.1 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | - 2.3 | - 0.9 | - 0.5 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Germany** | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.1 | 0.0 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| . Current Account Balance | 0.0 | 0.0 | - 0.5 | - 0.2 | 0.1 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

---

1/ A 10 percent increase in the average combined personal and corporate tax rates for the U.S. for each year of the forecast, starting in 1990.

The growth in private consumption and investment declines slightly for some of the years, in line with the lower growth in GDP. Industrial production growth also declines slightly for some years as GDP and investment growth slows down.

The effects on the German economy are quite similar to those on the Japanese economy, in that German export growth declines in the years 1990-92, again the result of lower U.S. import demand. With lower export growth, GDP growth also slows down, though only slightly and only for 1990 and 1992. This is probably because the lower GDP growth also drags down import growth such that the leakage from the economy is reduced, with the consequence that GDP growth is not much affected. For the same reasons, the current account balance is only slightly worsened. And as in the Japanese case, the growth of both consumption and investment slows down due to the slowing down of GDP growth. Interest rates are hardly affected at all. In sum, for both Germany and Japan, an increase in taxes in the U.S. has only very minor effects on their economies.

### iii. Japanese Fiscal Stimulus

As anticipated, this scenario did not lead to significant changes in the U.S. economy (see Table 19) largely because U.S. goods make up only a very small fraction of Japan's imports. Therefore, an increase in imports by Japan through fiscal stimulation of its economy would have only a slight effect on U.S. exports and do little to alleviate the U.S. current account deficit.

## TABLE 19: WEFA

### Japanese Fiscal Expansion[1]

### (Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.0 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | - 0.1 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | - 0.1 | - 0.2 | - 0.2 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Effective Exchange Rate | 0.0 | 0 0 | 0.0 | 0.0 | 0.0 |
| **Japan** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.3 | 0.4 | 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | - 0.1 | - 0.1 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | - 0.8 | - 1.4 | - 1.3 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Germany** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the year of the forecast starting in 1990.

This Japanese fiscal stimulus scenario is one in which Japanese public investment undergoes a sustained increase starting in 1990. However, as explained above, the effect on the U.S. economy is minor. The hoped for effect is to stimulate U.S. exports through an increase in Japanese import demand. Results of the simulation show, however, that export growth in the U.S. hardly changes at all, and when it does, for only two years out of the forecast period, and by only 0.1 percent. Hence, the current account balance of the U.S. is hardly affected. None of the other major economic variables for the U.S. are affected either. The effect on the Japanese economy, on the other hand, is as expected. Growth in total fixed investment increases beginning in 1989. As a result, the growth of GDP and hence private consumption also increase. The growth of both export and import volumes increases, due respectively to higher production capacity and import demand. The increase in the growth of import volume exceeds that of export volume such that the current account surplus decreases a little. It does not appear that there is crowding out in the economy as interest rates hardly change. In fact, nominal long-term rates remain the same, while nominal short-term rates increase only slightly for some years. The economy does not seem to be suffering from excessive inflationary demand either, since the personal consumption deflator barely changes and in fact declines very slightly for some years. With the increase in the growth of investment and GDP, the growth of industrial production also increases slightly, though the unemployment rate remains unchanged. Net government borrowing as a percentage of GDP rises somewhat, as it should, to finance the increase in public investment. In sum, a fiscal stimulus in Japan, with everything else held constant, on the whole generates healthy results in the economy with hardly any adverse effects

such as inflation. The only caveat is that the current account surplus diminishes somewhat, though with a very healthy surplus to begin with, this should not be deleterious at all to the economy.

As far as the German economy is concerned, the effects of a Japanese fiscal stimulus seem to be similar to those on the U.S. economy, that is, minimal. Growth in real GDP barely changes at all, which also holds true for the other major economic variables.

iv. Combined Scenario

This is a scenario in which all of the above three changes are imposed at the same time on the World Bank baseline scenario; monetary ease together with fiscal tightening in the U.S., combined with fiscal stimulation in Japan. This is by far the most probable of all the scenarios mentioned above, in the sense that should the U.S. government take action to reduce the budget deficit or even aim to balance it by the early 1990's, a monetary ease policy should be pursued simultaneously to alleviate the recessionary effects of the contractionary fiscal action. At the same time, the U.S. government might only agree on such fiscal tightening, despite the necessity for it whatever others may do, if it

could persuade its allies, notably Japan in this case, to undertake expansionary fiscal policies so as to expand export markets for the U.S., again to counteract the recessionary effects of its fiscal contraction.[15]

In this scenario, monetary ease is started by the Federal Reserve in 1988, in order to avert a recession given the huge debt overhang and the inaction on the part of the U.S. government to tackle the problem, which would result in further falls of the dollar and asset prices, rising interest rates and falling consumption and investment. In the face of this mounting crisis situation, the new U.S. administration would finally introduce measures to reduce the budget deficit. Given the time lag involved for such legislation to pass through Congress, it would probably not be until 1990 that actual fiscal tightening would be implemented.

The first two years of the forecast, that is 1988 and 1989, give the same results as the monetary ease scenario, as should be expected since none of the other policy changes have taken place yet. In 1990, when all three policies are in place, the results of the simulation show that the effects of U.S. fiscal tightening overwhelm the effects of the other policies (see Table 20). We know already from the earlier discussion in this paper that Japanese fiscal expansion does not have much effect on the U.S. economy. On the other hand, U.S. domestic fiscal tightening has a

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15/ This is true even if U.S. exports to Japan do not increase. As the Japanese economy heats up, U.S. output will become relatively more competitive with Japanese exports, both in other countries and domestically.

## TABLE 20: WEFA

### Combined Scenario

### (Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.3 | 1.0 | - 0.6 | 0.4 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.1 | - 0.2 | 0.0 |
| . Unemployment Rate | - 0.1 | - 0.1 | 0.0 | - 0.1 | - 0.2 |
| . Current Account Balance | - 2.2 | - 4.5 | 0.3 | - 2.2 | - 3.7 |
| . Short-Term Interest Rate | - 1.2 | - 1.7 | - 1.1 | - 2.2 | - 2.2 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Japan | | | | | |
| . Real GDP | 0.1 | 0.3 | 0.3 | 0.4 | 0.1 |
| . Personal Consumption Deflator | 0.0 | - 0.1 | - 0.1 | - 0.1 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.8 | 1.4 | 0.1 | 0.3 | 0.9 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | - 0.1 | 0.0 | - 0.1 |
| . Current Account Balance | 0.3 | 0.7 | 0.5 | 0.7 | 0.7 |
| . Short-Term Interest Rate | - 0.3 | - 0.3 | - 0.2 | - 0.1 | - 0.2 |
| . Effective Exchange Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

tremendous downward effect on GDP growth in the starting year, that is, in 1990. This effect in fact outweighs the higher GDP growth generated by the monetary ease policy, as can be seen in the lower GDP growth for that year under the combined scenario. The combined effects of U.S. monetary ease and fiscal tightening lead to interest rates which are lower than those in any of the individual scenarios, as is expected. Interest rates remain lower for the entire forecast period. The growth in private consumption in 1990 is quite a bit lower than the baseline number. This reflects the stronger effect of the tax increase compared to that of the easy money policy, a result of both the direct effect of higher taxes on consumption, and the secondary multiplier effect of lower GDP growth (due both to lower investment and consumption). Investment growth for 1990, on the other hand, reflects relatively equal weights of the two policies in affecting investment: the tax increase which reduces investment growth quite significantly, and monetary ease which increases investment growth by lowering interest rates. Import growth in 1990 is also quite a bit lower than the baseline, again reflecting the stronger effect of the tax increase compared with the easy money scenario on imports. This can be attributed to the direct effect of lower GDP growth on imports. Export growth remains unchanged from the baseline, reflecting equal weights of the two policies: the tax increase lowers exports and monetary ease increases exports. As a result, the current account for 1990 is hardly changed.

For the rest of the forecast period, that is 1991-92, GDP growth rebounds from the low point of 1990. In fact, the 1991 GDP growth rate is higher than any of the individual scenarios', due to the much higher investment growth of that year. This investment growth rate results from

the lower interest rates, in particular the lower long-term real interest rate. Given the higher GDP growth rate, consumption growth is also the highest of all the scenarios. For the rest of the period, GDP growth rates return back to the baseline, and so do consumption growth rates. Investment growth, however, is improved over the baseline, and in fact is the highest of all the individual scenarios. This follows from having interest rates which are the lowest of all the scenarios, a combined outcome of monetary ease and fiscal contraction, both of which exert a downward effect on interest rates. Both the export and import growth rates are higher than the baseline numbers, reflecting the stronger effects of the easy money scenario over the fiscal tightening one, as well as some contribution from Japanese fiscal expansion. In all, the combined scenario gives a current account balance which is worse than the baseline's, though not by a great amount, and which is also an improvement over the purely monetary ease scenario. The personal consumption deflator is not much affected for the entire period, as should be expected since it remains more or less unchanged for each of the individual scenarios also. The unemployment rate is somewhat improved, and so is the growth in industrial production, the former more the result of monetary ease and the latter more the result of fiscal tightening. Finally, net government borrowing as a percentage of GDP experiences the largest improvement, such that by 1991 the budget is back in balance and is in fact in a slight surplus, a state of affairs which remains through the end of the forecast period.

The above discussion seems to indicate that given the choice of scenarios, the combined one offers the best results in terms of averting a major sustained recession while at the same time balancing the budget

within a relatively short period of time. Moreover, while the combined scenario does not ameliorate the current account deficit, it only leads to a slight worsening. And aside from the one year of low growth, that is 1990, when the tax increase is first introduced, growth rates for most of the variables rebound back to those of the baseline scenario's, such that there is not any sustained recession or inflation either.

B. OECD

Alternative scenarios were derived from the OECD Interlink model based on the Bank's baseline assumptions. These scenarios include: (i) monetary ease, through the lowering of the U.S. discount rate by two hundred basis points for each year of the forecast, beginning in 1988; (ii) U.S. fiscal deficit correction through an increase in the average personal tax rate by 10 percent beginning in 1990; (iii) Japanese fiscal stimulus, through an increase in public sector investment starting in 1990; and (iv) an attempt at simulating a coordinated effort between the U.S. and Japan to correct the major external imbalances through a combination of the factors involved in the above three scenarios.

Several differences arose in planning these scenarios for the Interlink simulations compared to the Wharton Model. First, like the Wharton simulations, it was not possible to accommodate the lower interest rates through an increase in non-borrowed reserves. However, unlike in the Wharton simulation, where interest rates were affected through the discount rate, it was necessary to impact the short-term rate directly for the Interlink simulation. This was done by lowering the three month U.S. Treasury Bill rate by two hundred basis points.

Second, unlike the Wharton model, we were able in this case to affect only personal (household) taxes. Business tax rates were held constant for the tax increase scenario. This scenario is one that we feel is more likely for the U.S. in the near future.

In each of the sections describing the results of the alternative scenarios, a table will present the differences from the baseline for the same variables.

i. U.S. Monetary Ease

The U.S. monetary ease scenario is one in which the U.S. Treasury Bill rate was lowered (exogenously) by two hundred basis points starting in 1988 and continuing throughout the forecast period. All other exogenous variables were held the same as in the OECDBANK baseline. One reason for a scenario such as this would be to try to avert a recession in the U.S. economy as the economy adjusts to correct the twin deficits, should the Federal Reserve feel that the risk of recession is greater than the risk of higher inflation.

In the U.S., lower short-term interest rates lead to lower long-term (nominal and real) interest rates. In fact, while nominal long-term interest rates fall by an average of 15.3 percent over the forecast period, real long-term rates fall by an average of 43.5 percent over the same time period. However, while the percentage change in nominal rates increases each year until the last, the change in real rates peaks in 1990 as inflation starts to slow down.

As one would expect, this leads to substantially higher levels of investment (the investment growth rate doubles by 1992). GDP growth is higher than in the baseline for all years, but the amount of change in the growth rate shows a distinctly cyclical pattern (as do the exchange rate assumptions which went into the forecast). Domestic demand changes by about the same amount as GDP.

Exports (volume) are expected to grow exceptionally well in 1988-1990, before slowing down and even becoming negative in 1992. Import volume growth is very slow in 1988-89, but quickly builds strength in the later years. Domestic demand does not seem to be growing by enough to warrant the large turnaround in imports.

The excellent growth in export volume for the next few years translates into substantial improvement in export value growth in the period 1988-91. Import value growth, which continues to be high in 1988, falls sharply by 1990 before rebounding in the later years. This leads to an improvement in the current account balance of the U.S. with the deficit down to $72.8 billion in 1990, before it starts to build again. However, this is virtually identical to the base case solution.

This result is very similar to the result which emanated from the Wharton simulation. In both cases, export and import volumes are higher than in the baseline, while the current account worsens compared to the baseline.

While inflation did not increase significantly in the Wharton simulation, the Interlink model is much more sensitive to (a) the increase in money supply, (b) the lower interest rates, and (c) faster growth in the economy. Inflation grows 2.6 percent faster in 1988, 10 percent faster in 1989, and 83.3 percent faster in 1992. This higher rate of inflation helps to slow private consumption in the later years of the forecast.

Employment growth, although still slow, rises much faster than in the baseline. Net government borrowing improves to the point where the government is virtually at a balanced budget by 1990 and is in surplus in 1991 before returning to a small deficit in 1992. This is largely due to the increased revenues which are derived from faster economic growth, as well as the lower interest rates which translate into lower interest payments on outstanding debt.

Turning now to the cross-country effects of the U.S. monetary ease, the effect on the German economy is not at all dramatic, and in fact, the effect is even smaller than in the Wharton simulation. With exchange rates remaining exogenously determined, lower interest rates in the U.S. should imply lower interest rates for Germany.[16] However, this does not happen in the OECD simulation. German interest rates remain unchanged from the base case. Nevertheless, investment growth increases in this simulation after the first year. Investment growth in Germany falls by five percent compared to the baseline in the first year, then increases by ten percent in the next three years.

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16/ With the deutsche mark unable to appreciate, one must assume away any chance for capital flows from the U.S. to Germany.

Both domestic demand and prices grow relative to the baseline in the first year, while all variables remain unchanged in the second year of the simulation. Higher investment and stronger exports lead to a stronger growth in GDP by 1990, with slightly higher growth in the following years (see Table 21).

With respect to Japan, the easier monetary policy has no effect on Japanese interest rates either. This may be due to the fact that the Japanese economy is rather insulated from capital flows. Yet, investment grows faster than in the baseline, leading to higher growth in GDP in all years. Both the Japanese and German current account surpluses increase in this simulation, probably due to the healthier market for their goods in the United States.

ii. U.S. Tax Increase

This scenario is designed to simulate the effect of policies which would balance the Federal budget in the early 1990s. As expected with a large tax increase, net government borrowing falls dramatically in the first year of the tax increase, and in fact, the budget nearly balances in that year. However, investment and consumption both fall substantially due to the tax increase, and the lower economic growth, which is sustained through 1992, leads to a new increase in net government borrowing. In this scenario, by 1992, government borrowing as a percentage of GDP is higher than in 1989, before the tax increase.

## TABLE 21: OECD

### Monetary Ease Simulation[1]

### (Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 0.2 | 0.6 | 0.3 | 0.1 | 0.4 |
| . Employment | 0.1 | 0.5 | 0.3 | 0.0 | - 0.1 |
| . Inflation | 0.1 | 0.5 | 1.0 | 1.2 | 1.5 |
| . Current Account Balance | - 2.6 | - 1.8 | 1.1 | - 1.3 | - 3.2 |
| . Long-Term Interest Rate | - 0.6 | - 1.1 | - 1.5 | - 1.8 | - 1.8 |
| **Japan** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| . Employment | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 |
| . Inflation | - 0.1 | 0.0 | 0.0 | 0.1 | 0.2 |
| . Current Account Balance | - 0.5 | 0.0 | 0.4 | 0.1 | 2.0 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Germany** | | | | | |
| . Real GDP | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| . Employment | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 |
| . Inflation | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 |
| . Current Account Balance | 1.6 | 3.0 | 4.0 | 5.2 | 7.0 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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1/ A lowering of the U.S. Treasury Bill rate by 200 basis points for each year of the forecast.

GDP growth rates fall to 0.3 percent in 1990 , -0.6 percent in 1991, and -0.7 percent in 1992 (see Table 22). Investment growth is also negative in those years.

While the low levels of GDP growth lead to a slow-down in the volume growth of imports, import volume growth remains large nevertheless. The growth in the value of imports declines a great deal relative to the baseline. Export growth, both in volume and value terms, improves somewhat in the later years.

As a result of the slow-down in economic growth, the current account balance improves by $11 billion in 1990, the year in which the deficit is smallest. Despite the upturn in the deficit after 1990, due to the appreciation of the dollar, the deterioration in the current account balance is not nearly as bad in this simulation as in the base case. In fact, in 1992, the deficit is still lower than it was in 1989.

Nevertheless, despite drastically lower rates of inflation, an improvement in the current account balance, and a temporary reduction in the Federal deficit, one must note that the strongest impact of this scenario is that the U.S. enters a major recession which lasts through the end of the forecast period. During this time, investment falls, leading to a poor outlook for later in the 1990s.

The effect of a tax increase in the United States on the German economy is to lower German GDP growth throughout the period. Export growth is not as bad as one would expect it to be, given the economic condition of

TABLE 22: OECD

U.S. Tax Increase[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.0 | 0.0 | - 1.4 | - 1.3 | - 0.5 |
| . Employment | 0.0 | 0.0 | - 0.5 | - 0.9 | - 0.4 |
| . Prices | 0.0 | 0.0 | - 0.3 | - 1.4 | - 2.0 |
| . Current Account Balance | 0.0 | 0.0 | 10.7 | 18.9 | 23.3 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Japan | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.2 | - 0.4 | - 0.3 |
| . Employment | 0.0 | 0.0 | 0.0 | - 0.2 | - 0.2 |
| . Prices | 0.0 | 0.0 | 0.0 | - 0.1 | - 0.2 |
| . Current Account Balance | 0.0 | 0.0 | - 1.3 | - 2.8 | - 4.1 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.2 | - 0.5 | - 0.6 |
| . Employment | 0.0 | 0.0 | 0.0 | - 0.1 | - 0.1 |
| . Prices | 0.0 | 0.0 | 0.1 | 0.1 | - 0.1 |
| . Current Account Balance | 0.0 | 0.0 | - 3.1 | - 6.6 | - 8.9 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1/ A 10 percent increase in the U.S. personal tax rate for each year of the forecast, starting in 1990.

the United States. Investment growth falls in all of the years, while the growth in domestic demand is lower only in 1991 and 1992. Inflation is also lower in these years.

With respect to Japan, the tax increase in the U.S. lowers Japanese GDP growth, mainly through lower exports. GDP growth falls by 6.7 percent in the first year of the tax increase, and by 15 percent in each year after that. Lower exports lead to a fall in employment growth of about 10 percent, which in turn leads to substantially lower growth in domestic demand. The fall in domestic demand growth, however, is not as large as the fall in GDP growth.

With lower exports, the Japanese current account surplus declines by US$ 3.1 billion in the first year, US$ 6.6 billion in the second year, and US$ 8.9 billion in the final year of the forecast relative to the baseline.

### iii. Japanese Fiscal Stimulus

The Japanese fiscal stimulus involves a large increase in public sector investment in 1990 and 1991. As a result, the growth rate of total investment in Japan grows by 130 percent in the first year and 300 percent in 1991. This increase lifts GDP, through domestic demand, to very high levels of growth (see Table 23). In fact, the growth rate for domestic demand triples in 1991.

TABLE 23: OECD

Japanese Fiscal Expansion[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.2 | 0.1 |
| . Employment | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Prices | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| . Current Account Balance | 0.0 | 0.0 | 0.9 | 4.3 | 5.9 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Japan | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| . Employment | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Prices | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Current Account Balance | 0.0 | 0.0 | 0.2 | 0.9 | 1.5 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.0 | 0.0 | 1.3 | 4.1 | 1.8 |
| . Employment | 0.0 | 0.0 | 0.2 | 0.8 | 0.4 |
| . Prices | 0.0 | 0.0 | - 0.4 | - 0.6 | 0.9 |
| . Current Account Balance | 0.0 | 0.0 | - 3.0 | - 11.7 | - 14.1 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the years of the forecast.

Unexplainedly, this boost in government spending also lowers the growth rate of inflation from the baseline. Inflation is approximately 25 percent lower in this scenario than in the baseline. This result is very similar to the simulation using the Wharton model, and indicates that consumer demand is not growing excessively.

The increase in government spending naturally worsens the government's budgetary account, and at the same time, the current account falls even further than in the base case. The increased borrowing by the government to finance the investment has no effect on the long-term interest rate, indicating that there is no crowding out effect in the economy.

In summary, a fiscal stimulus in Japan, with exchange rates being held exogenous, generates a fairly healthy economy with few adverse effects, other than the expected increase in net government borrowing and the lower current account surplus.

The reason for running this scenario was to see if a Japanese fiscal expansion would help solve the twin deficit problem of the United States by raising the level of economic activity. However, the effect of the Japanese expansion on the United States is minimal. In the first year, there are no measurable effects. In 1991, GDP growth increases by a great deal, largely because of increased export activity. This results in an improvement in the U.S. current account deficit.

The effect on Germany is almost identical. GDP growth improves in the second year, as do exports. This leads to a higher level of surplus on the current account. There are no other measurable effects.

iv. Combined Scenario

In this scenario, all of the above changes are imposed on the model at the same time, while holding exchange rates and commodity prices at their predetermined levels. This is the most probable of all the scenarios attempted thus far, since one would expect that if the U.S. were to take action to reduce the budget deficit through a major tax increase, a monetary policy would also be followed which would reduce interest rates in an attempt to offset a recession. In addition, it now appears that the Japanese have begun a unilateral expansion, which may help to pull the U.S. through the contractionary consequences of a tax increase.

Monetary ease begins in 1988, through an assumption that the Federal Reserve has decided to take action to avert a recession, given the threat of possible further falls in asset prices, rising interest rates, and possible further falls in the dollar. With this monetary ease policy in effect, the new U.S. administration will set out to reduce the budget deficit, at first through a tax increase. Given the time lag to pass such legislation, such a bill would probably not take effect until 1990.

Looking at the results of this simulation, the first two years give the same results as the monetary ease scenario. This is not at all surprising, since the other policy changes do not take place until 1990. In 1990, when the other policies do take effect, the tax increase overwhelms all of the other actions.

In 1990, in the U.S., GDP growth falls to 0.7 percent, down 59 percent from the base case (see Table 24). While the monetary ease and Japanese fiscal stimulus help to ease the recession caused by the tax increase, they only serve to postpone a period of actual negative growth by one year.

The increase in personal taxes in 1990 leads to lower consumption, hence lower domestic demand, lower GDP, and finally, lower growth in employment. The government deficit moves into surplus in 1990, but due to low economic growth, falls back into a small deficit by 1992. Still, this is far superior to the 2.3 percent level of net government borrowing as a percentage of GDP that resulted from the base case.

The lower level of interest rates from the monetary ease policy in 1988 and 1989 results in a higher level of inflation in 1990, but the tax increase and concomitant lower economic growth lead to a lower level of inflation in 1992.

The current account balance improves a great deal in this scenario, bottoming out in 1991 at $60 billion, rather than in 1990 at $72 billion as in the base case.

For Germany, there are very few effects. In 1991, the GDP growth rate falls, as does the growth rate of domestic demand and employment. There are however, no dramatic effects in Germany (see Table 24 for more detail).

TABLE 24: OECD

Combined Scenario[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.2 | 0.6 | - 1.0 | - 1.0 | - 0.4 |
| . Employment | 0.1 | 0.5 | - 0.3 | - 0.8 | - 0.4 |
| . Prices | 0.1 | 0.5 | 0.7 | 0.0 | - 0.4 |
| . Current Account Balance | - 2.6 | - 1.7 | 10.6 | 21.8 | 26.0 |
| . Long-Term Interest Rate | - 0.6 | - 1.1 | - 1.5 | - 1.8 | - 1.9 |
| Japan | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | - 0.1 | 0.0 |
| . Employment | 0.0 | 0.0 | 0.0 | - 0.1 | 0.0 |
| . Prices | - 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | - 0.5 | 0.0 | - 0.7 | - 0.8 | - 0.7 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.1 | 0.0 | 1.4 | 3.7 | 1.4 |
| . Employment | 0.0 | 0.1 | 0.2 | 0.7 | 0.4 |
| . Prices | 0.0 | 0.0 | - 0.3 | - 0.4 | 1.1 |
| . Current Account Balance | 1.7 | 3.0 | - 2.4 | - 13.1 | - 16.2 |
| . Long-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1/ A combination of the U.S. monetary ease, U.S. tax increase, and Japanese fiscal expansion policy stocks.

In Japan, the effects of the fiscal expansion more than outweigh the effects of the contraction in the United States. Although growth rates are not quite as high as in the Japanese fiscal expansion scenario alone, due mainly to lower imports by the U.S. in this scenario, the combined simulation presents a healthy Japanese economy indeed.

## C. LINK

### i. U.S. Monetary Ease

This policy simulation is effected through a reduction by 250 basis points of the U.S. Federal Funds rate, which gives rise to an approximate reduction of 200 basis points in the Treasury Bill rate. This is sustained throughout the forecast period and starts in 1988.

The outcome of this simulation is as expected. GNP is higher throughout the forecast period, although the increase in GNP growth rates for each individual year is only of a magnitude of 0.1-0.2 percent (see Table 25). The most dramatic outcome of this simulation seems to be the severe reduction in the federal deficit, from $85 billion in the LINKBANK scenario to $35 billion in the current scenario, a reduction of nearly 60 percent. This reduction in the deficit is probably due to two reasons. First, the reduction in interest rates has reduced interest payments by quite a large magnitude. Second, the monetary ease has stimulated economic growth to the extent that tax revenues are quite a bit higher.

TABLE 25: Project LINK

Monetary Ease Simulation[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 |
| . Personal Consumption Deflator | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | - 0.1 | - 0.1 | - 0.2 | - 0.2 | - 0.3 |
| . Current Account Balance | 2.6 | 1.9 | 1.8 | 1.2 | 0.9 |
| . Short-Term Interest Rate | - 2.0 | - 1.9 | - 2.0 | - 2.1 | - 2.0 |
| Japan | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.1 | 0.6 | 1.1 | 1.3 | 3.1 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | - 0.1 | - 0.3 | - 0.1 | - 0.1 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | - 0.1 | - 0.1 | - 0.2 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Current Account Balance | - 1.2 | - 4.1 | - 3.6 | - 3.0 | - 2.2 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1/ Lowering of the U.S. federal funds rate by 250 basis points for each year of the forecast, starting in 1988.

As expected with a monetary ease scenario which increases GNP growth, the trade balance is worsened compared to LINKBANK for all the years of the forecast period, due to the higher imports (both nominal and real) and only slightly higher exports (in nominal terms; in real terms there is hardly any change). The slightly higher nominal exports are mostly due to the somewhat higher export price index, which is due to higher domestic inflation (borne out by the slightly higher GNP deflator) thus raising the cost of production. The current account, however, improves compared to the baseline for all the years in the forecast period, probably because the lower interest rates decrease the level of interest payments on U.S. securities held by foreigners. This is also the same route through which the federal deficit is reduced.

The lower interest rates increase investment, for the entire forecast period. Consumption, on the other hand, is only improved slightly, due to the rather small increase in GNP.

The effect of a monetary ease policy on the Japanese economy is quite small. Japan's GNP increases slightly over the baseline, with this increase growing through the forecast period. This increase in GNP is led by a higher level of exports, which follows from the higher demand by the United States. As a result, both the trade account and the current account improve somewhat. Private consumption and private investment are barely affected, with both showing very slight increases towards the end of the forecast period. The slightly higher GNP leads to a slightly lower unemployment rate.

There is a larger and also negative effect of a U.S. monetary ease policy on German economic growth, predominantly due to lower interest income from dollar-denominated securities resulting from the lower U.S. interest rates. This lower interest income in turn lowers the exports of goods and services even though the exports of goods only is increased somewhat (due to higher GNP in the U.S.). The lower exports of goods and services lowers GNP, which leads to a decline in goods imported. Hence, the trade balance improves as exports of goods increase and imports of goods decrease. The current account, on the other hand, deteriorates due to lower inflows of interest income. The lower GNP leads to lower inflation and higher unemployment. With a lower GNP, both private investment and private consumption fall. Interest rates decline a little due to the lower investment demand.

ii. U.S. Tax Increase

The U:S. tax increase scenario is implemented by increasing the personal tax rate by 10 percent for each year starting in 1990. The desired outcome of decreasing the federal deficit is achieved, but quite surprisingly, not by as much as under the monetary ease scenario described above. The federal deficit falls to $42 billion, which is around a 50 percent decrease, compared to the close to 60 percent decrease in the easy money scenario. This is due to the lower GNP growth which reduces the tax base and hence has a suppressive effect on tax revenues despite the increase in the personal tax rate. The results of this scenario are summarized in Table 26.

## TABLE 26: Project LINK

### U.S. Tax Increase[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 0.0 | 0.0 | - 0.3 | - 0.2 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 |
| . Current Account Balance | 0.0 | 0.0 | 3.5 | 8.9 | 12.3 |
| . Short-Term Interest Rate | 0.0 | 0.0 | - 0.1 | - 0.2 | - 0.1 |
| **Japan** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | - 0.1 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | - 0.8 | - 2.2 | - 3.8 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | - 0.1 | 0.0 |
| **Germany** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | - 0.1 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | - 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | - 0.1 |
| . Current Account Balance | 0.0 | 0.0 | - 0.2 | - 0.6 | - 0.9 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

---

1/ A 10 percent increase in the U.S. personal tax rate for each year of the forecast, starting in 1990.

GNP growth is reduced, as expected, although not by a significant amount, and in fact there is no change in the growth rate in 1992, the last year of the simulation. In level terms, obviously, GNP is lower through the years when the policy is in effect. This decline in GNP originates from lower consumption (arising from the higher personal tax rate) and then the multiplier effect. The lower GNP also leads to the lower investment. Interest rates go down, the result of both the lower federal deficit and the consequent smaller "crowding out", as well as of the lower investment demand. Both nominal and real imports decline, which is to be expected given the reduced GNP growth. Real exports remain more or less unchanged, but nominal exports fall, though only very slightly due to the decline in the export price index. The latter could be due to the decline in the GNP deflator, a result of lower GNP growth, which could lead to lower costs of production and hence a lower export price index. Finally, with the decrease in GNP growth, the unemployment rate increases, albeit slightly.

An increase in taxes in the U.S. decreases Japanese GNP growth, as expected, but only very slightly. The main channel of the shock is, of course, through the external accounts. Exports fall, in both nominal and real terms. The decline in exports leads to the lower GNP growth, which in turn lowers imports, again in both nominal and real terms. Together with the decrease in the trade balance, the current account also goes down. Private consumption decreases slightly and so does private investment. The GNP deflator is practically unchanged, the unemployment rate increases somewhat, and interest rates fall very slightly due to the slight decrease in GNP.

Turning now to Germany, the effects on its economy are very similar to those on the Japanese economy. First of all, GNP growth falls only slightly, in fact by the same percentages below the baseline as in the case for Japan. This is a result of the slightly higher decrease in exports, both nominal and real, compared to the fall in imports, again both nominal and real. As a result, both the trade and current accounts deteriorate somewhat, pulling down GNP growth. Private consumption and private investment decline, a result of the lower GNP. Interest rates fall due to the lower investment demand. Inflation declines very slightly, and unemployment increases somewhat, both results following from the decline in GNP growth.

iii. Japanese Fiscal Expansion

This policy scenario is implemented by increasing Japanese public investment starting 1990. The impact on the U.S. economy is practically non-existent, which is to be expected since Japanese imports from the U.S. make up only a very small fraction of U.S. exports.

The impact domestically on the Japanese economy is somewhat larger, but still not very significant (see Table 27). GNP increases and imports grow somewhat, leading to worsening trade and current accounts. The curious outcome is the slight decrease in real exports of goods and services. The effect on raising inflation is only more noticeable by the end of the forecast period. Unemployment decreases throughout the forecast period given the higher GNP.

TABLE 27: Project LINK

Japanese Fiscal Expansion[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| United States | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | 0.0 | 0.0 | - 0.1 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Japan | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | - 0.1 | - 0.4 | - 0.9 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Germany | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.0 | 0.0 | 0.0 | 0.0 | - 0.1 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1/ Increasing the growth rates of Japanese public sector investment over the baseline growth rates by 15.79 percent, 25.71 percent and 0 percent, respectively, for the years of the forecast starting in 1990.

Turning now to the German economy, the impact on it is almost as insignificant as that on the U.S. economy. There is barely any effect at all.

iv. Combined Scenario

Not surprisingly, for the U.S. economy the combined scenario gives an outcome which comprises the effects of the monetary ease and tax increase policies. This follows from the fact that the Japanese fiscal expansion policy does not produce any notable effects in the case when it is imposed singly, so that it does not have much effect in the combined scenario either.

In the first two years of the simulation, 1988 and 1989, since the tax increase has not taken place, the outcome of the combined scenario on GNP is exactly that for the individual case of monetary ease, that is, higher growth. In 1990, when both policies are in effect, GNP growth is 1.0 percent, which is between the 0.9 percent under the tax increase scenario and the 1.3 percent under the monetary ease scenario. This is, however, lower than the 1.2 percent rate under the base case. So it seems that the tax increase has a higher weight in affecting GNP growth in that year. In 1991, GNP growth is again somewhere between the rates from the two policies implemented singly, and is also the same as in the base case. By the end of the forecast period, 1992, GNP growth has actually surpassed the base case number, although it is still in between the numbers from the two scenarios implemented singly.

In sum, the combined scenario raises the level of GNP compared to the base case. This is so despite relatively similar growth rates from 1990 onwards, because of the initial stimulus from monetary ease in the earlier two years. The most significant effect of the combined scenario is, however, the tremendous reduction in the federal deficit. In fact, the federal deficit has turned into a slight surplus by 1992. This follows from the fact that the federal deficit is already reduced under each scenario individually. Similarly, the current account deficit is also reduced the most under the combined scenario, although the magnitude of the reduction is much smaller than that for the federal deficit. The same also holds for the trade account.

The inflation rate increases and the unemployment rate goes down, results which are as expected given the higher GNP (see Table 28). Interest rates are lowered by quite a bit compared to the base case, since they decline under each of the monetary ease and the tax increase scenarios. These much lower interest rates are in turn responsible for the dramatic reduction in the current account deficit, compared to the smaller reduction in the trade deficit. The lower interest rates also encourage higher investment, as reflected particularly in the higher level of non-residential investment under the combined scenario in comparison with the base case. Private consumption, on the other hand, is actually lower in level terms under the combined scenario compared to the base case, probably due to the higher personal tax rate. Public consumption is also lower as a result of the lower interest rates and hence lower government outlays in the form of interest payments.

## TABLE 28: Project LINK

### Combined Scenario[1]

(Difference from Baseline)

| | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|
| **United States** | | | | | |
| . Real GDP | 0.1 | 0.2 | - 0.2 | 0.0 | 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| . Unemployment Rate | - 0.1 | - 0.1 | - 0.1 | 0.0 | 0.0 |
| . Current Account Balance | 2.6 | 1.9 | 5.1 | 10.0 | 13.4 |
| . Short-Term Interest Rate | - 2.0 | - 1.9 | - 2.0 | - 2.1 | - 2.0 |
| **Japan** | | | | | |
| . Real GDP | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 |
| . Personal Consumption Deflator | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| . Current Account Balance | 0.1 | 0.7 | 0.2 | - 0.8 | - 1.6 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Germany** | | | | | |
| . Real GDP | - 0.1 | - 0.3 | - 0.1 | - 0.1 | - 0.1 |
| . Personal Consumption Deflator | 0.0 | 0.0 | - 0.1 | - 0.2 | - 0.2 |
| . Unemployment Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| . Current Account Balance | - 1.2 | - 4.1 | - 3.8 | - 3.4 | - 2.7 |
| . Short-Term Interest Rate | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

---

1/ A combination of the U.S. monetary ease, U.S. tax increase, and Japanese fiscal expansion policy stocks.

In sum, under the combined scenario, investment is encouraged, and the trade and current account deficits are improved, all of which increase GNP despite the lower levels of consumption, both public and private.

The effect on the Japanese economy is a combination of the effects of all three policies; the U.S. monetary ease policy which stimulates Japanese growth, the U.S. tax increase policy which decreases Japanese growth, and the Japanese domestic fiscal expansion policy which increases growth. The net effect of these three policies is an increase in Japanese growth, although only to a small extent.

Both the trade and current account surpluses are reduced by the end of the forecast period, 1992, but only very slightly. Along with the slightly higher GNP growth are slight increases in consumption and investment. The inflation rate barely increases and the unemployment rate is improved slightly.

As is the case for the U.S., the Japanese fiscal expansion policy has only barely perceptible effects on the German economy. The effects of the combined scenario are therefore a combination of the effects of just the monetary ease and tax increase policies in the U.S., both of which have a negative impact on German growth. The trade balance improves, reflecting the larger effect of the U.S. monetary ease in improving the German trade account over the effect of the U.S. tax increase in lowering it. The current account, however, deteriorates, the result of the effects of both policies, as discussed above. Private consumption and private investment decrease. The decline in GNP has the expected effect of lowering inflation and increasing unemployment, as well as lowering interest rates.

## VIII. CONCLUSIONS

The first purpose of this paper was to examine the IECAP forecast for industrial countries in light of the forecasts produced by organizations outside the Bank. Since IECAP has not been relying on a completely linked global macroeconomic model, the question was raised as to whether the IECAP forecast would be consistent with forecasts produced by linked models. In order to answer this question, Bank assumptions for exchange rates (produced by IECAP) and for commodity prices (produced by IECCM) were introduced into three global models under the auspices of Wharton Econometrics (The WEFA Group), OECD, and Project LINK.

The result of this exercise showed that, even given the imposition of Bank assumptions, differences existed between the model results and the IECAP forecast. However, major differences also occurred between the three linked models forecasts, using these assumptions in each case.

Despite differences in the annual growth rates of the key economic variables, the three models produced forecasts quite similar to IECAP's in terms of the medium-term time path of the forecast. That is, given the Bank's assumptions, each model produced a small slow-down in 1988, low growth in 1989 and/or 1990, and a recovery in the U.S. in 1991 and 1992. The baseline produced using Project LINK was especially close to the IECAP forecast, both in terms of the magnitudes of the growth rates, and the time path. On the other hand, the Interlink model produced a sustained period of low growth, with no improvement in the final two years. The more sensible results produced by the LINK model may be a result of both its

more detailed set of equations for each country than are included in either Interlink or the Wharton World Model, and its ability to produce quarterly forecasts for the industrial countries. This quarterly time-frame allows a more realistic pass-through of economic interactions.

In some instances, the changes that were imposed on the exchange rates included fluctuations that were too much for the models to handle in a consistent fashion (even though these fluctuations merely continue the pattern of the recent past). However, the results in this paper were presented with each model having been run in pure form, rather than with adjustments made to fine-tune the model to produce a nice looking forecast. Thus, results such as the high rate of inflation in Germany in 1992, which would be politically unacceptable and which would probably be nullified by government action, were not fine-tuned in the similations reported in this paper.

The results obtained by running the Project LINK model using the World Bank's assumptions are close enough to IECAP's forecast that the LINK model could be used by IECAP to authenticate its industrial country forecast and to aid in producing its developing country forecast.

In terms of the industrial countries, Project LINK would give IECAP staff the linked global model which can help to ensure consistent results. For the developing countries that are covered under Project LINK. IECAP staff would have access to detailed country models which would provide forecasts based on IECAP's global assumptions. A separate study is forthcoming which will look into the feasibility and practicality of incorporating Project LINK modeling into IECAP work.

The second purpose of this paper was to test alternative scenarios on each model to see what would be the effect of various policy actions. Four alternative simulations were run. These have been explained in great detail in earlier parts of this paper. The major conclusion that can be drawn from these four simulations of the models is that the combined policy action scenario makes the most sense. While the level of policy action (i.e., how expansive a monetary policy - how tight a fiscal policy) was not settled by the simulations, clearly the world economy does not suffer as much in 1989/90 with the combination policy as with the tax increase alone. In addition, the economy is far better off in the 1990s with this sort of policy.

The second item of importance which can be gleaned from this set of simulations is that while the U.S. policy combination coupled with the Japanese expansion leaves those two countries in a fairly healthy state, the German economy suffers (in the LINK simulation) from the assumption that they are not taking any action. It is clear that an expansion by Germany would be an integral part of any successful policy action by more than the United States alone.

In summary, the use of the WEFA, OECD, and Project LINK models bears out the IECAP forecast to a large extent. The exchange rate assumptions are based on a scenario in which the pressures that were building in the financial markets last summer will return. The reaction in the financial markets, while not predictable in detail, are likely to cause an increase in ex ante constraints on U.S. borrowing while making the need for such borrowing lower in future years. Thus, with no policy-induced

adjustments, the asset markets may be in for another shock. This could lead to some combination of further falls in U.S. stock and bond prices and the (assumed) further devaluation of the dollar. The evidence from the model simulations bear out that this will lead to rising U.S. inflation and falling rates of compensation in real terms. Real U.S. private wealth would then be expected to fall, which will lower domestic demand in the United States over time. Long-term nominal interest rates will rise, although real rates may continue on a downward trend. These broad elements of the IECAP outlook are consistent with the results of calculations using existing world models, as reported in this paper.

The IECCM Division of the World Bank forecasts a relatively large increase in wheat prices in 1988-89. Underlying this forecast is the assumption that world grain production will fall in the 1987-88 period. Wheat prices are expected to decline in 1990 which could be a result of overproduction undertaken in reaction to the higher prices of 1988 and 1989.

The LINK and IECCM forecasts for wheat prices are quite different from each other. IECCM's forecast shows a lot more variability in the growth rates, with wheat prices declining by a large percentage in 1987 and then increasing by a similarly large percentage in 1988, easing off in 1989, declining again in 1990, then finally recovering in 1991. In effect, IECCM's forecast shows a cyclical pattern for wheat prices. By contrast, the Project LINK forecast shows first increases in prices up to 1989, then a decline in prices in 1990 and 1991. For the short-run LINK forecast, part of the price increase in 1987 is attributed to the drought in India as well as larger than expected purchases by the Soviet Union. However, the high level of stocks, especially in the U.S., has partly alleviated the price increase. This increase in wheat price is expected to be transitory, however, once production goes back to normal levels afterwards.

The Wharton wheat price forecast for 1988 shows a decline from 1987. Wharton assumes that the current stock level of wheat is high enough to forestall a price increase despite the expectation of a decline in foreign grain production. This higher level of stocks is also responsible for the much lower increase in wheat prices in 1989 compared to the IECCM

forecast. Wheat prices are expected to grow moderately in the period 1989-1992, perhaps because the lower prices in the late 1980s lead to some underproduction in the 1990s.

The OECD does not provide a forecast for wheat, but does give a forecast for the commodity group food. The OECD price forecast for food is for relatively stable growth in prices, averaging 3.9 percent growth over the projection period. The degree of stability is not surprising, since the aggregated food groups tend to cancel each other out. The growth in food prices is expected to peak in 1991 at 5.1 percent, before coming down to 4.2 percent in 1993. In contrast, when the IECCM price forecast is aggregated to include all food groups, one finds quite fast price growth in 1988 (10.8 percent), followed by an immediate decline to 1.3 percent in 1990. Yet, on average, the IECCM growth rate for food prices (3.5 percent) is very close to the OECD forecast.

The IECCM other cereal price forecast follows in general the path of its wheat price forecast. The recent drought in Southeast Asia is assumed to be responsible for increasing the prices of rice and maize substantially in the short run. The decline in other cereals prices in 1990 may be due to increased supply as production recovers back to normal levels.

The Wharton forecasts for other cereal prices also follow the path of the wheat price forecast, with continued positive growth up through 1992, based mainly on the assumption of continued strong demand. Again, as it is for the wheat price forecast, the Wharton other cereal price forecast

does not exhibit a cyclical pattern as shown in the IECCM forecast, probably because it does not assume under and over-production from one period to the next.

The Project LINK forecast for other cereals follows closely IECCM's forecast. They both show a relatively large increase in other cereal prices in 1988, followed by a smaller increase in 1989, decline in 1990, and recovery in 1991. For the short-run LINK forecast, the large increase in rice prices in 1988 is due both to the drought in India as well as to low levels of stocks. The increase in corn prices in 1988 is not as large due to a higher level of stocks. These increases in prices are expected to be transitory once production returns to normal levels afterwards.

An individual price forecast for other cereals is not available from OECD.

The IECCM forecast for coffee, tea, and cocoa shows a partial recovery in coffee prices in 1988 after the decline in 1987. After 1988, prices are projected to grow at a moderate rate, but not quite recovering back to the 1986 high. The recovery of coffee prices in 1988 is probably due to the reintroduction in October 1987 of the global export quota of the International Coffee Agreement. Sustained increases in coffee prices are not expected for the remainder of the period, however, due to the forecast of a large crop from Brazil which would counteract the restriction of supply by the quota agreement.

The Wharton forecast for coffee, tea, and cocoa shows a partial recovery in coffee prices in 1988 after a decline in 1987, though the magnitude of the recovery is not too large. After 1988, prices are expected to grow at a moderate rate, but not by enough to recover to their 1986 high level.

Although the OECD forecast for tropical beverages does not include a commodity by commodity breakdown, it is easy to see from the forecast pattern what is being predicted. Tropical beverage prices fell drastically in 1987, due largely to a fall in cocoa prices. Coffee prices actually began to rise by the end-of-1987. For the period as a whole, tropical beverage prices are expected to rise by a modest 1.8 percent. The expected trend is for good growth in 1988 and 1989, followed by almost no growth in 1991 and a modest recovery in the outer years. Coffee price increases are generally due to the agreement reached in 1987 among producers which set export quotas for the next few years. Cocoa prices are expected to fall, however, due to large and growing inventory accumulation and disagreement within the cartel.

Price forecasts for coffee and cocoa are very close between the LINK and IECCM models. They both show a recovery of prices in 1988, from negative growth a year before. After the recovery in 1988, both show a slowing down of the growth rate in 1989, a recovery in 1990, and levelling off of the growth rate in 1991.

For the short-run LINK forecast, prices for the group as a whole increase a bit in 1988 because of the increase in coffee prices, since cocoa prices are expected to fall through 1989. These patterns for coffee and cocoa prices could be attributed to the same reasons as for the OECD case discussed above.

The IECCM forecasts for oilseeds and fats and oils show prices going up in 1987, with increases continuing through 1990. This forecast of an increase in oil prices could be attributed to unexpected imports by the USSR at the end of 1987, higher imports by drought-stricken India for the next few years, reduced supplies of copra and a less expensive dollar. Such price increases are expected to continue up to 1990, at which time there would be a small decline, probably because the urgency of higher import demand would have dissipated. After 1990, oil prices are expected to grow at a moderate rate.

The Wharton forecast for oilseeds and fats and oils shows a decline in prices in 1988. This is probably due to its forecast being made prior to a large import by the Soviet Union which affected world prices. Steady, but non-spectacular growth, ranging from 2 percent to 4 percent, is expected through the early 1990s.

Individual price forecasts for oilseeds and fats and oils are not available for OECD and Project LINK.

The IECCM forecast for other food prices shows a relatively big increase in 1988, of 8 percent, followed by moderate but steady increases in prices for the rest of the period. This price pattern applies to all

the commodities within the group except for beef (that is, applies to sugar, bananas and oranges). The larger increase in 1988 for the IECCM forecast is due mostly to the increase in the price of sugar, since the prices of the other commodities are expected to experience only moderate increases. The increase in sugar prices for 1988 is based on the forecast of lower production due to bad weather. After 1988, the IECCM forecast is for steady increases in sugar prices, based mainly on the assumption of continued growth in world consumption as well as restraint in production such that stocks would be further reduced. On the other hand, beef prices are expected to decline throughout the 1988-1990 period as expected record meat production in the US becomes available.

The IECCM and Wharton forecasts for other food prices for the 1987-92 period are quite similar with the exception of 1988, for which the IECCM other food price forecast is quite a bit higher. The Wharton forecast shows moderate, but steady growth of other food prices ranging from 2.5 percent to 3.5 percent for that period.

Only a partial comparison between the IECCM and the LINK models could be given for the other food commodity group, since the LINK model only provided a price forecast for sugar, and not for the other commodities included by IECCM for the group. It is therefore not surprising to find that the LINK forecast gives the most variation. A large increase in sugar prices is expected for 1988, due to smaller than expected crops in Brazil and drought-related damage to the South and South East Asian crop such that the prices of sugar rose at the end of 1987 and are expected to remain high for 1988. But after 1988, sugar prices are expected to, in contrast to the

IECCM forecast, first, level off and then actually decline in 1990, followed by a recovery in 1991. This price pattern is probably based on the assumption of production returning back to normal levels after 1989.

The IECCM forecast for other agricultural non-food products shows a great deal of variation in prices, with a big increase of 25 percent in 1987, followed by a decline in 1988-89, and recovery in 1990-92.

The cotton price forecast exhibits the same pattern as that for the overall commodity group; a huge increase in 1987 followed by declines in 1988-89, with recovery thereafter. The rationale behind this forecast is that the sharp increase in cotton prices in 1987 have led to acreage expansion and production increases in the northern hemisphere, and therefore result in weaker prices late in 1988 and into 1989. The price weakness may be intensified by the expected slowing of economic growth in the industrial countries during 1989 and 1990. The lagged price effect on cotton plantings should cause lower cotton plantings in 1989 and 1990, which would facilitate a recovery in cotton prices at the onset of economic recovery from 1990 onwards.

The IECCM rubber price forecast again follows more or less the general trend of the overall commodity group, with a decline in prices forecasted in the medium term reflecting projected lower economic growth. A recovery in prices is expected after 1990 as economic growth is expected to recover.

Unlike the IECCM forecasts for cotton and rubber in which 1988 prices are expected to decline or remain the same, jute prices are expected to increase in 1988 due to flooding in Bangladesh. Steady increases in jute prices are forecasted for the remaining period, probably due to sustained increases in demand.

In contrast to the IECCM forecasts, the Wharton forecast for other agricultural non-food prices shows little variation during the projection period, with slightly higher increases in 1987 and 1988 of 9.3 percent and 6.8 percent respectively, followed by moderate increases through the end of the forecast period.

The OECD provides a comparable price forecast for the commodity category of agricultural raw materials which shows more volatility than the IECCM price forecast for agricultural non-food.

Agricultural raw materials prices are expected to average 2.8 percent growth over the forecast period in the OECD baseline. In 1989, however, prices are expected to grow by only 1.5 percent due to the low growth rate of GDP for industrial countries in that year. However, the Bank expects agricultural raw material prices to decline in that year, so the OECD forecast is still relatively optimistic.

Project LINK does not provide a price forecast for this category.

The interesting fact behind the IECCM forest product price forecasts is that they are made in terms of local currencies, since the markets are Western Europe and Japan, and then converted into dollars. The

implication of this is, therefore, that aside from the usual demand and supply factors, the forecasts are also influenced by the dollar exchange rate against these local (Japanese and European) currencies. The IECCM forecast numbers show a large increase in 1987, probably due to the drop in the value of the dollar. This is followed by a smaller but still substantial increase in 1988 and then yet smaller increases thereafter. This pattern seems to reflect the pattern of the IECAP dollar exchange rate forecast, which is a depreciation of the dollar up to 1989, followed by appreciation.

The Wharton assumption for forest product prices shows much smaller increases in 1987 and 1988 when compared to the IECCM numbers, and even a slight decline in 1990. After 1990, growth in forest prices recovers and stays at moderate rates of 4.4 percent and 5.0 percent until the end of the forecast period.

The short-run LINK forest product price forecast shows an increase in prices in 1987, due to, among other factors, the recovery of the paper industry and strong demand from housing construction in Japan and the United States. Forest product prices are expected to decline in 1988 because of the expected economic slow-down in the United States. In fact, housing starts have been falling sharply in the U.S. for three consecutive months. Prices are expected to remain low after 1988 also, probably due to expected low demand as economic growth stagnates worldwide.

The IECCM forecast is for petroleum prices to decline in 1988 and 1989, due to the expected decline in real economic growth in the OECD countries as well as the expectation that OPEC will not be able to adhere

to its production quota. This decline in oil prices flattens out in 1990, after which prices go up again, probably because of the expected pickup in real economic growth rates for the OECD.

The Wharton forecast for petroleum prices shows a slowing of growth until 1990, during which growth is zero, and accelerating afterwards. The Wharton numbers reflect the underlying assumption that oil demand will remain fairly healthy even though world growth may slow down in the forecast period. Another reason for the higher Wharton oil prices is the belief that continuing tension in the Gulf will add further premiums to oil prices.

Petroleum price forecasts are not provided by either OECD or Project LINK.

The other fuel commodity group for IECCM consists of coal only, for which the price forecast follows closely that for petroleum. After a decline in prices in 1987 and 1988, coal prices start to recover in 1989 and are expected to maintain a steady and moderate growth rate till the end of the forecast period. Despite the intentions of major exporters to demand higher prices on their contracts, the expectation of lower petroleum prices in the medium term should provide a strong negotiating advantage to coal importers to keep prices down.

After the decline in other fuel prices in 1987, Wharton forecasts a healthy growth in other fuel prices for the 1988-92 period; in the 4.0 percent to 6.5 percent range. No cyclical pattern is exhibited for this commodity group.

Neither the OECD or Project LINK provide price forecasts for this other fuel commodity group.

The IECCM metals price forecast is for very strong growth in prices in 1987 and 1988, followed by a rather large decline in 1989 and levelling off in 1990, with recovery thereafter. Most, though not all, of the metals within this commodity group follow the aforementioned price pattern. The assumption behind the short-term forecast of a price decline is declining demand due to the expected slow-down in industrial country growth as well as expanded production.

The Wharton metal price forecasts show little cyclical fluctuation, with moderate but steady growth ranging from 4.0 percent to 6.0 percent throughout the forecast period.

Turning to the OECD forecast for metals and minerals, prices are expected to rise by 8.0 percent in 1988 and average 2.6 percent growth over the forecast period. The high rate of growth in 1987-1988 is due largely to the long period in the 1980s when demand exceeded supply and inventories were drawn down. The expected dropoff in the growth in prices in 1989 is due to the recessionary environment which is envisaged for that year. Prices are expected to be stronger in the 1990s, as the industrial countries' economies recover from a period of low growth.

The trend of the Project LINK growth rates for the prices of metals and minerals follows in a broad sense quite closely that of the growth rates of IECCM prices. However, in terms of the levels of the

changes, the LINK forecast is quite a bit different from that of IECCM. The LINK forecast shows a high growth rate of prices in 1987, the consequence of a long period in which consumption exceeded production and in which inventories were drawn down. The growth rates of the prices start declining after 1987 and in fact turned negative in 1988-89. This slow-down in the increase and eventual downturn in prices is probably due to the expected economic slow-down of industrial countries. Prices start to recover in 1991 as these countries start to recover economically.

We now turn to a discussion of the price forecasts for some of the individual metals. Individual metals price forecasts are not available from OECD.

The IECCM forecast for copper prices is for an increase in 1988, followed by declines in 1989 and 1990 due to anticipated supply increases and the economic slow-down in the industrial economies.

The Wharton forecast for copper prices is somewhat similar to IECCM's with an increase expected for 1988, followed by a decline in 1989, due to the expected fall in demand as global economic growth slows down as well as to the new production capacity coming onstream.

Turning to the LINK forecast, copper prices are expected to increase in 1988, and start declining in 1989 until 1991, after which they increase again. For the short term outlook, copper prices rose about 30 percent in 1987 due to stronger than expected demand, especially in the construction sectors in Japan and the U.S. and the industrial sectors in

the latter country. Inventories fell sharply from previous levels, a result of disruptions in supply caused by strikes in Canada and Peru, transportation problems in Zambia and bad weather and an earthquake in Chile. In 1988, however, prices are expected to fall because of the fears of a recession and the news of a significant slow-down in housing starts in the United States. Despite this expectation of falling prices, the average copper price for 1988 is still expected to be higher than the 1987 average due to the high level at the beginning of 1987.

The IECCM forecast for nickel prices is for a large increase in 1988, followed by a return slightly above 1987 levels in 1989 and 1990. The reason behind this forecast is: (1) technical problems leading to a halt in USSR exports; (2) the imposition of export taxes by the Dominican Republic; (3) technical and labor difficulties at Inco, Canada; and (4) lowered supplies of stainless steel scrap. However, inventories of stainless steel as well as potential new suppliers coming onstream should alleviate the upward pressure on prices, and these factors are probably responsible for the downturn in prices after 1988.

The Wharton forecast for nickel prices is very similar to the IECCM forecast, with a rather large increase predicted for 1988, followed by a decline. This price decline is due to the expected weakening of demand as industrial country growth slows down, as well as due to the expansion of production.

Project LINK states that nickel prices rose sharply in 1987 due to a strong increase in steel production and smaller sales by the Soviet Union. No further significant price increases are expected as the U.S.

economy is expected to slow down. Prices are expected to stay at around the same levels until 1992, when they rise somewhat, as industrial country growth recovers.

The IECCM forecast for aluminum prices again follows the pattern of the overall group, which is an increase in 1988 followed by a decline. This price increase in the short-run is probably due to a combination of the factors of buoyant demand and strained production capacity. The decline in prices after 1988 could be due to expected additional productive capacity coming onstream.

Wharton did not provide an aluminum price forecast.

Project LINK states that aluminum prices rose with copper prices up to the October crash, after which there was a considerable slow-down that lasted until the end of 1987. In 1988 they started rising again and have so far reached levels comparable to copper prices.

Turning now to lead prices, the IECCM forecast is generally pessimistic through 1990, but with a strong showing first in 1987 and 1988. The higher prices in the short run are based on the assumption of continued increases in lead consumption but only marginal increases in production. The decline in prices afterwards is probably based on the assumption of weakening demand and expanding production.

The Wharton forecast for lead prices is very similar to IECCM's, with strong prices in 1987 and 1988, followed by a decline in 1989 for the same reasons.

Project LINK does not provide a lead price forecast.

IECCM forecasts for zinc prices are that they would remain more or less level in the period 1987-89, while those for tin prices are that they would register moderate increases in the same period. A large increase in tin prices is expected in 1990, whereas only a moderate increase is expected for zinc.

The Wharton forecast for tin and zinc is for a moderate decline in zinc prices in 1989 and a larger decline in tin prices in 1990. The assumption behind the Wharton zinc price forecast is flat consumption combined with increased production.

Project LINK states that tin prices rose by the end of 1987, as inventories came down to more normal levels. Even though prices are still low by historical standards, Project LINK does not expect them to rise much due to the general economic slow down, at least not until 1992, when prices are expected to rise somewhat due to world economic recovery.

The IECCM short- and long-term forecasts of gold and silver prices have been made on the basis of analysis combining the understanding of the cycles inherent in these series, the relationships between inflation rate and exchange rate movements and gold and silver prices, and expected changes in the supply and demand for the metals. The expected decline in the dollar through 1989 should have a positive impact on gold prices. The higher inflation brought about by the declining dollar will further enhance gold prices. On the other hand, the larger supply of gold brought about by

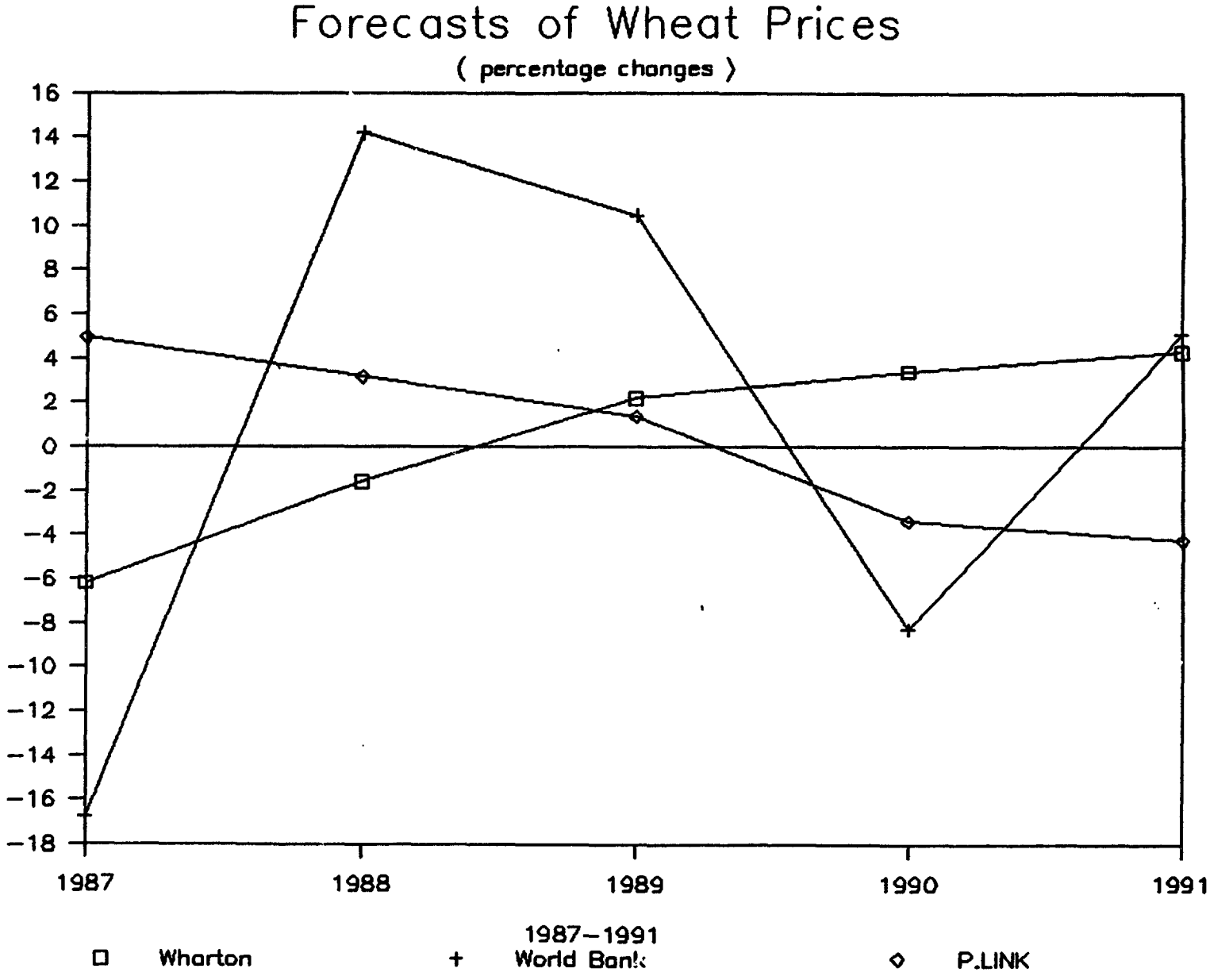
higher prices in recent years which has spurred increased exploration and production will exert a dampening effect on gold prices. On balance, gold prices are still expected to increase in 1988 and 1989. By 1990, the appreciating dollar and the concurrent decline in the inflation rate will lead to a lower gold price.

Since silver is produced mainly as a by-product of other metals and since lead, zinc and copper production is expected to increase in 1989 and 1990, silver production is also expected to increase which will depress prices. Expected lower industrial demand in the 1989-90 period will further dampen prices. On the other hand, the expected depreciation of the dollar and the concurrent higher inflation for that period will counter these price dampening effects. The expected outcome of these countering tendencies is a levelling of silver prices in 1987-88, followed by an upswing in 1989 and a decline in 1990.

Wharton does not produce a price forecast for gold. It predicts quite high rates of growth for silver prices, 8.0 percent to 9.0 percent in the 1988-90 period, followed by a sharp downturn in 1991 and a moderate decline in 1992.

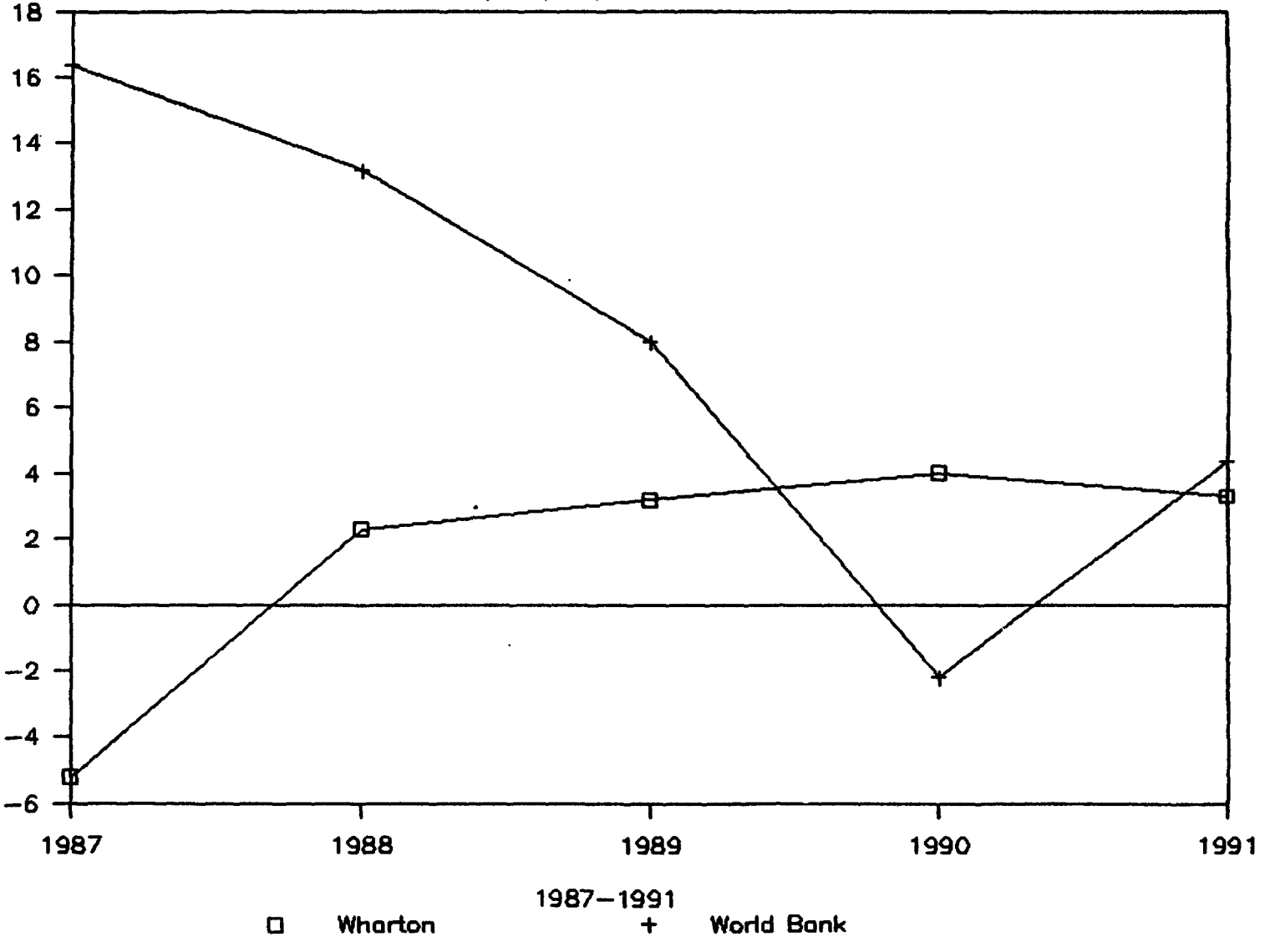
Project LINK does not provide either gold or silver price forecast.

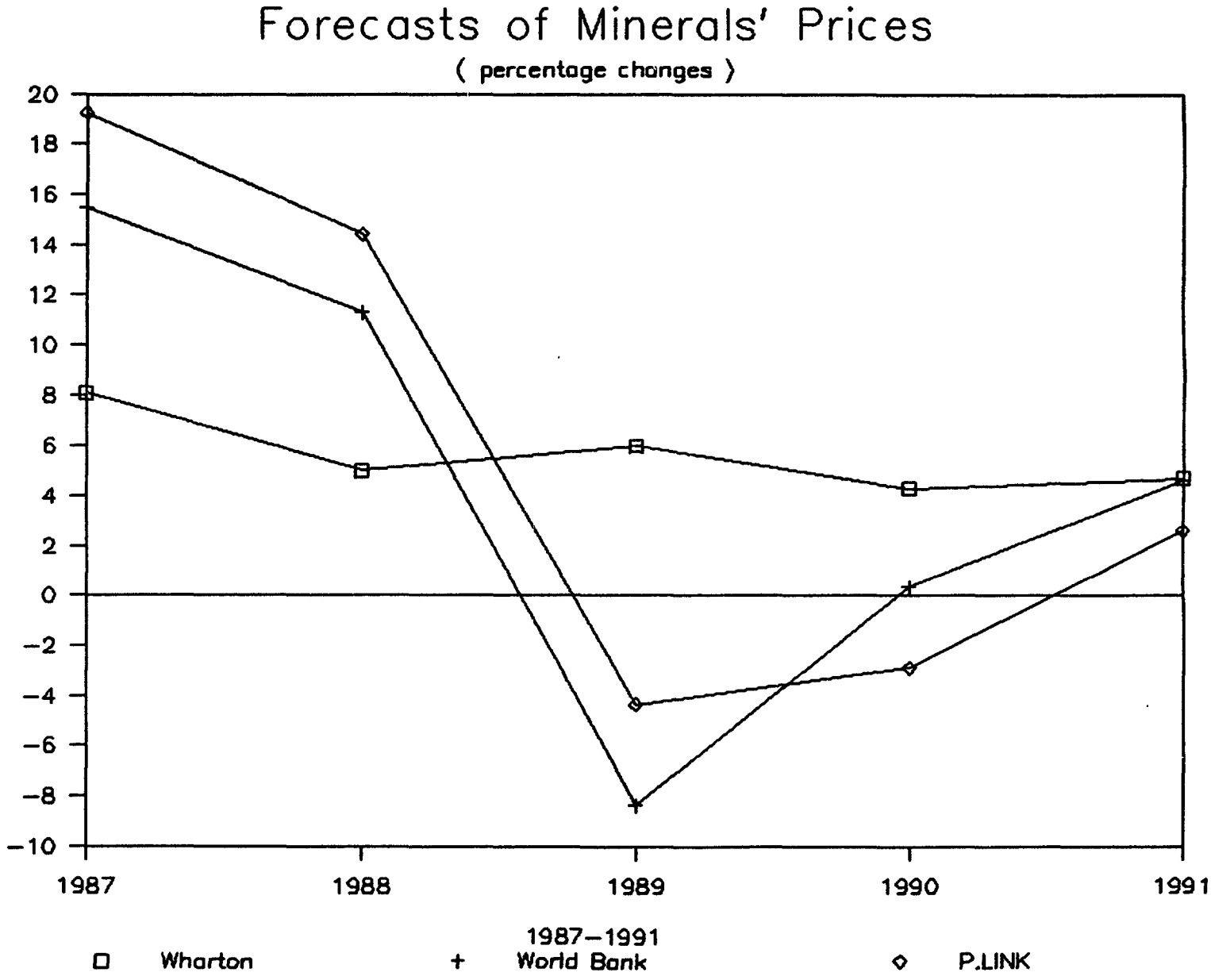
In general, the World Bank's commodity price forecasts contain more year-to-year fluctuation than the Wharton commodity price forecasts. This is illustrated in the following graphs, which compare the year-to-year percentage change in the nominal prices of several commodities. Where a Project LINK forecast was available, this is also shown.


Forecasts of Wheat Prices
( percentage changes )
16
14
12
10
8
6
4
2
0
−2
−4
−6
−8
−10
−12
−14
−16
−18
1987
1988
1989
1990
1991
1987−1991
Wharton
World Bank
P.LINK

# Forecasts of Oilseeds, etc. Prices

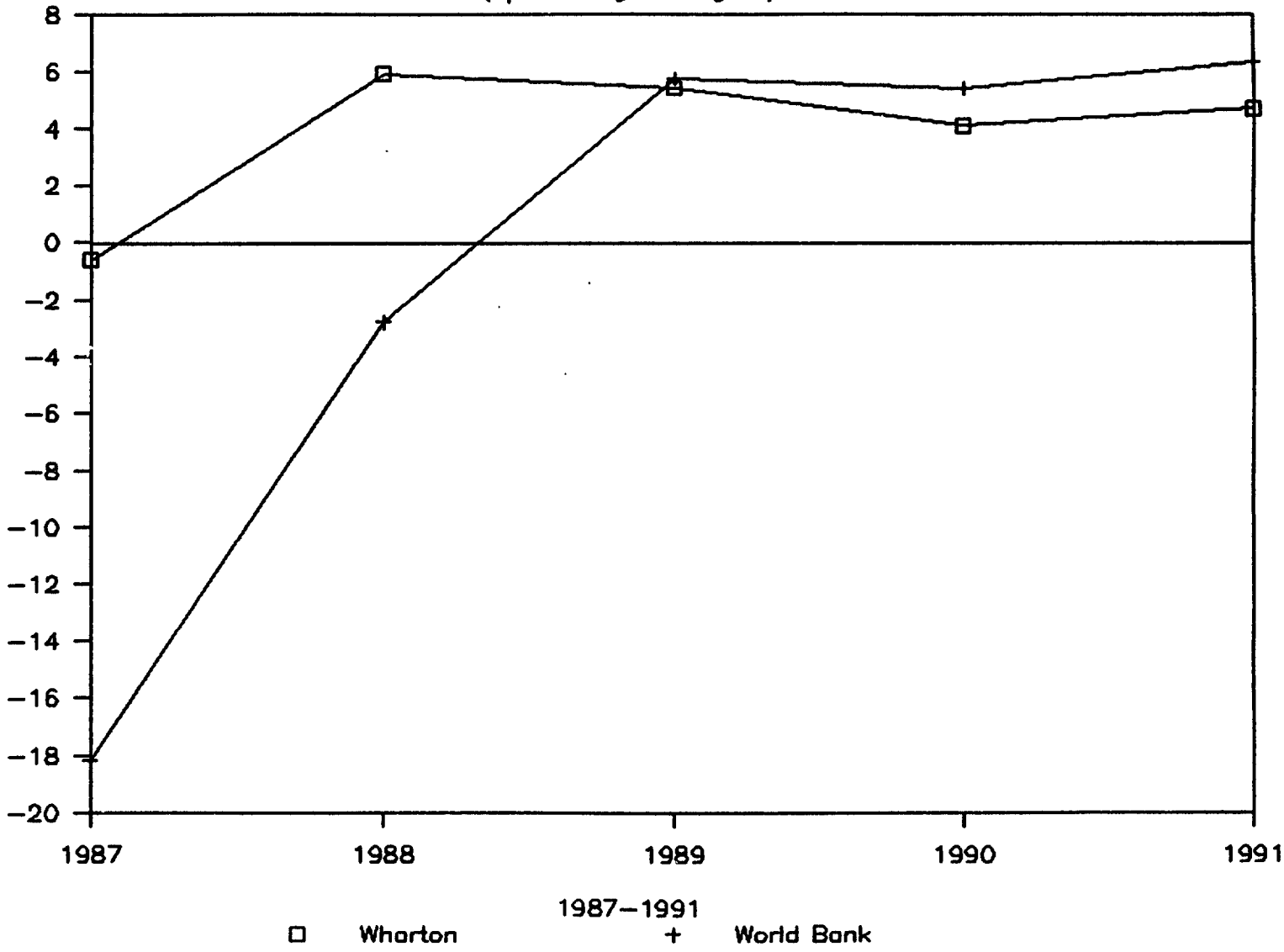
( percentage changes )




Forecasts of Minerals' Prices
( percentage changes )
20
18
16
14
12
10
8
6
4
2
0
−2
−4
−6
−8
−10
1987
1988
1989
1990
1991
1987−1991
Wharton
World Bank
P.LINK

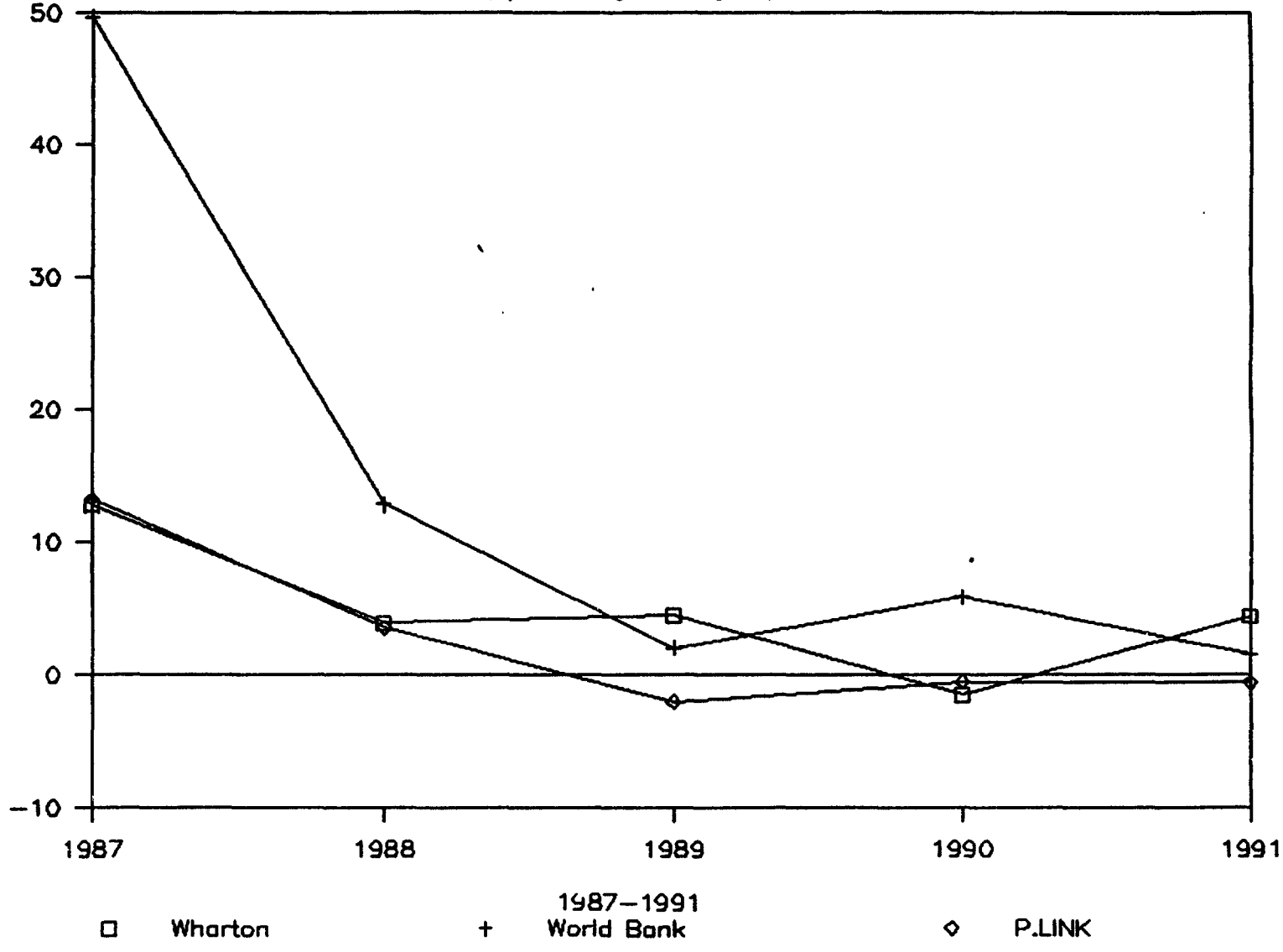
# Forecasts of Other Fuels' Prices

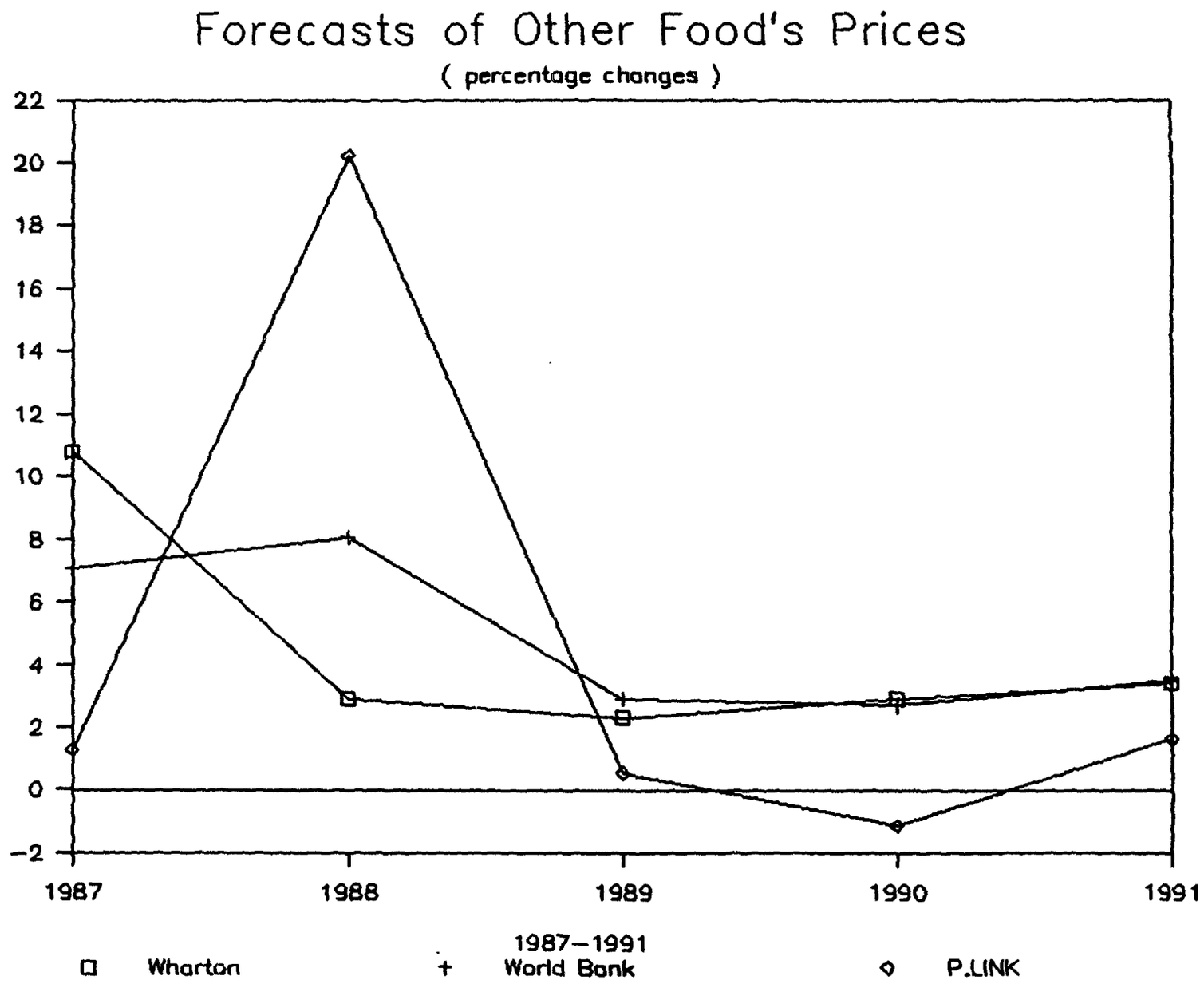
( percentage changes )



# Forecasts of Forest Products' Prices

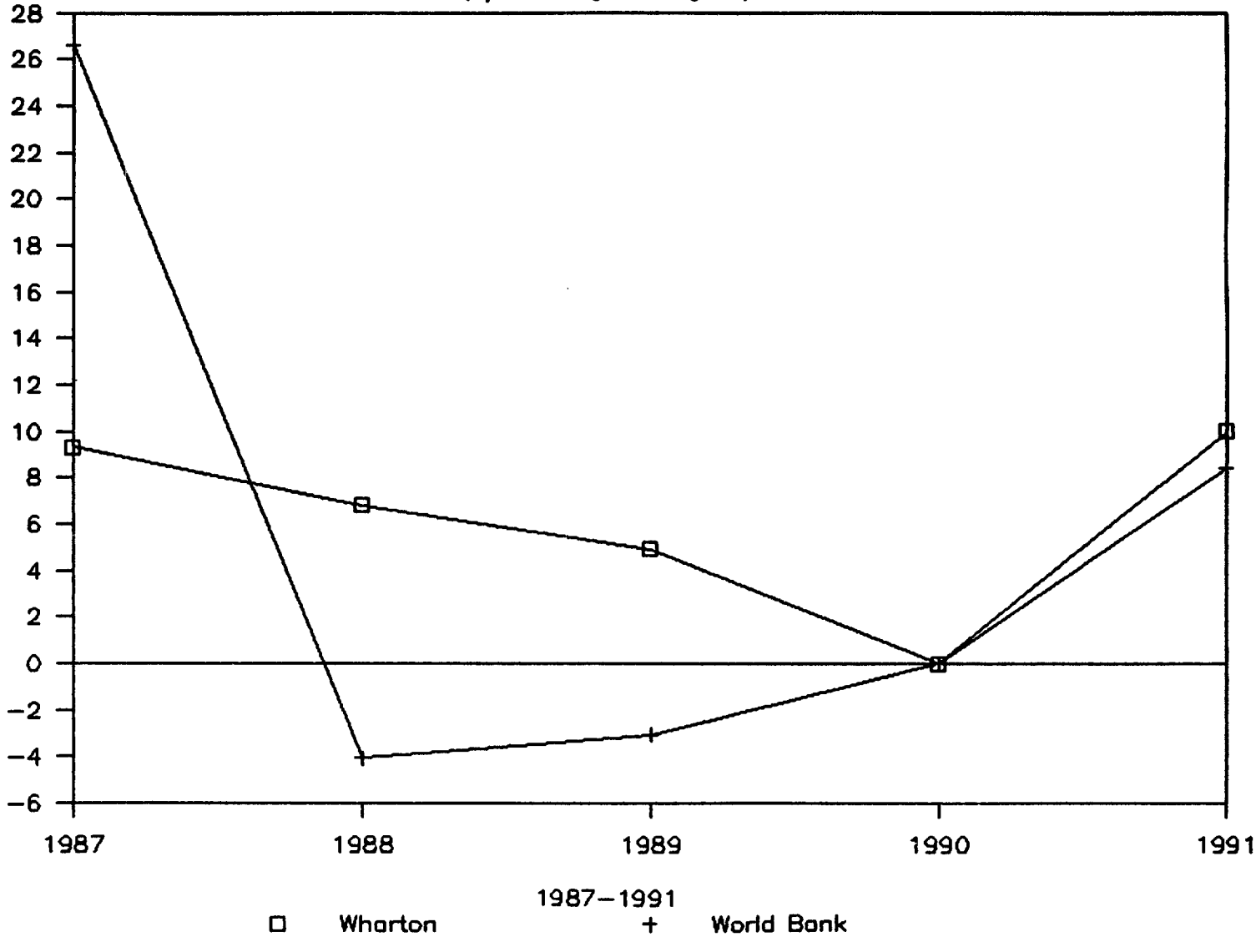
( percentage changes )




Forecasts of Other Food's Prices
( percentage changes )
22
20
18
16
14
12
10
8
6
4
2
0
-2
1987
1988
1989
1990
1991
1987-1991
Wharton
World Bank
P.LINK

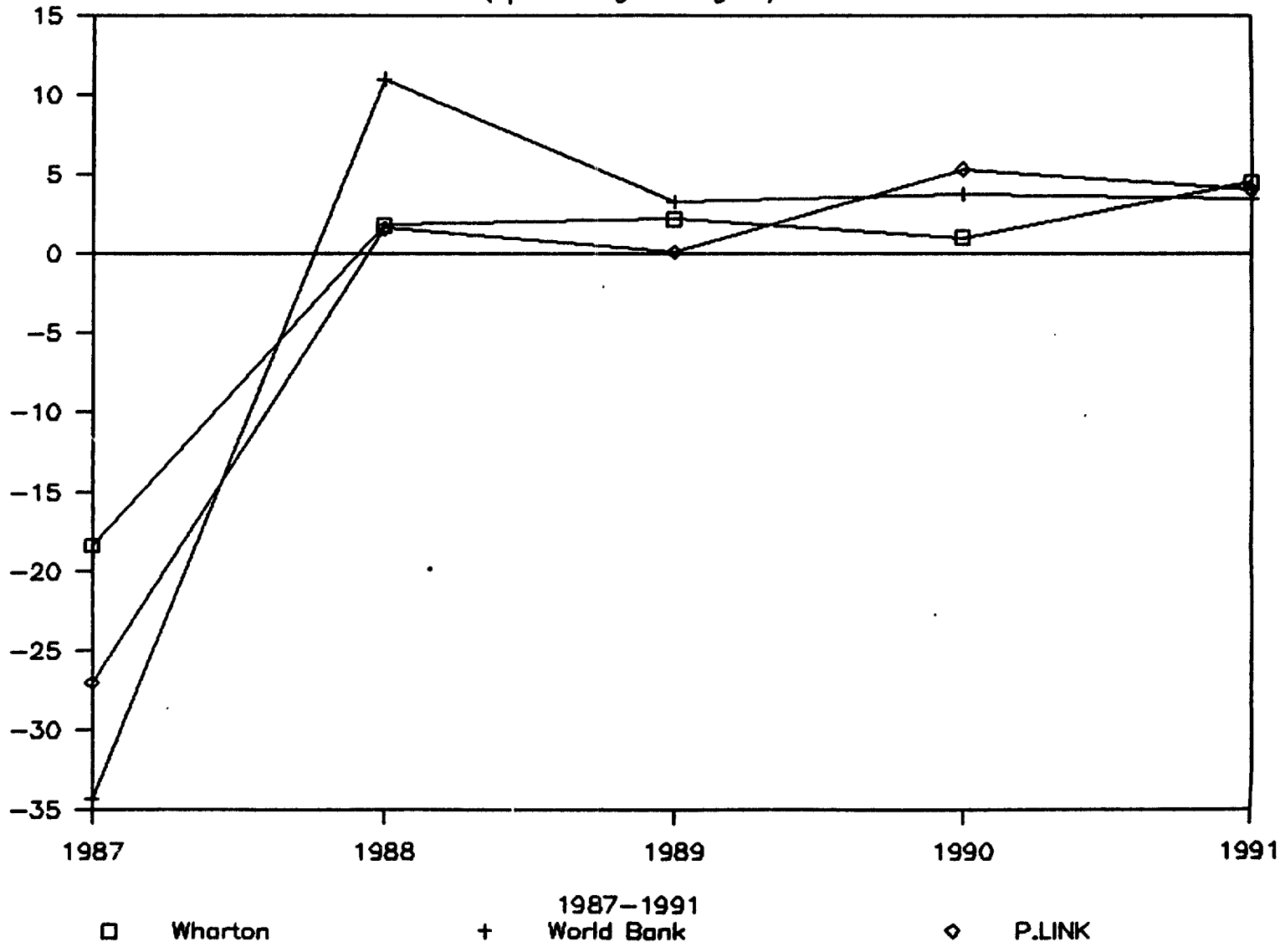
# Forecasts of Crude Petroleum Prices

( percentage changes )



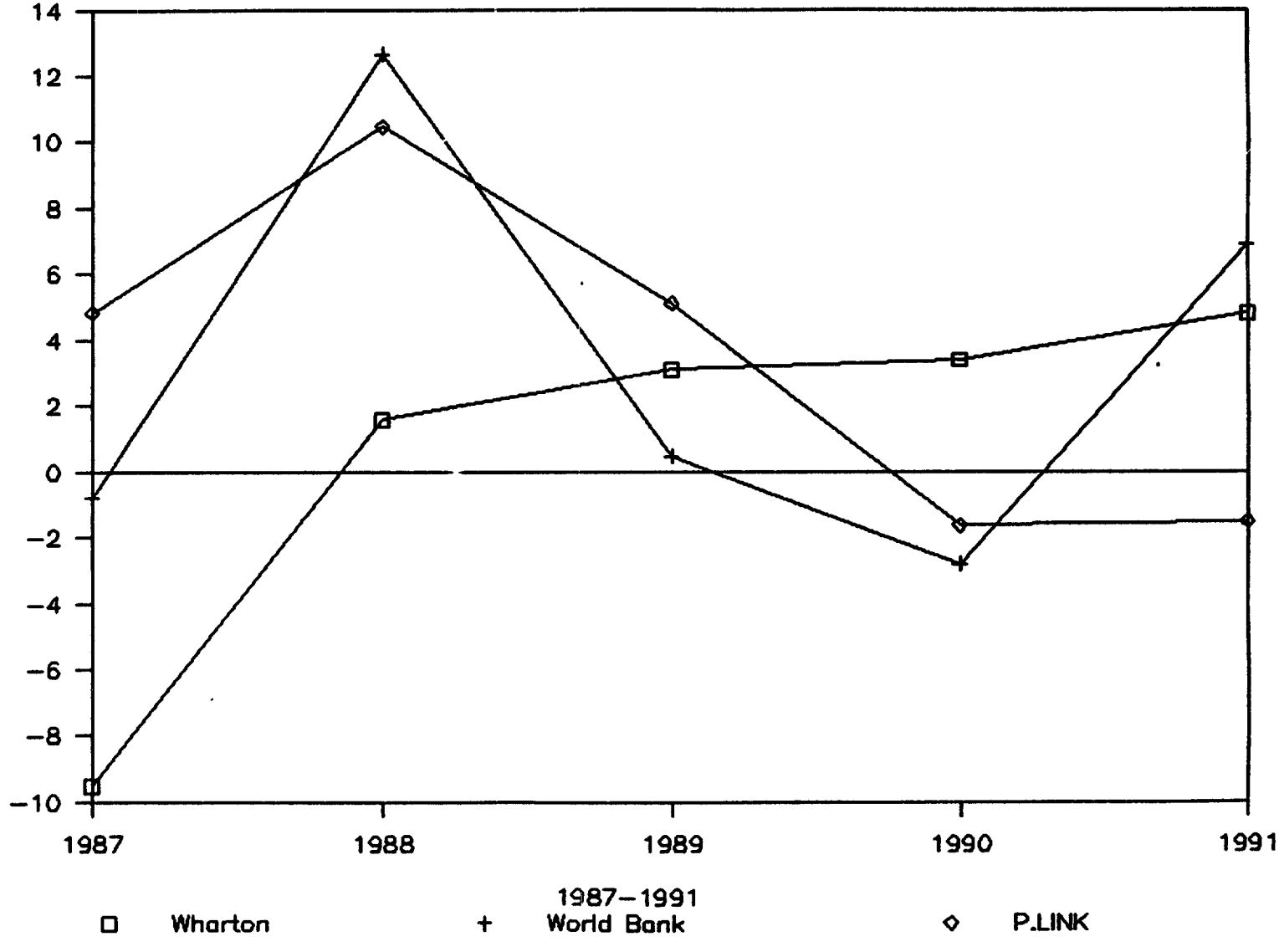
# Forecasts of Coffee, Tea & Cocoa Prices

( percentage changes )



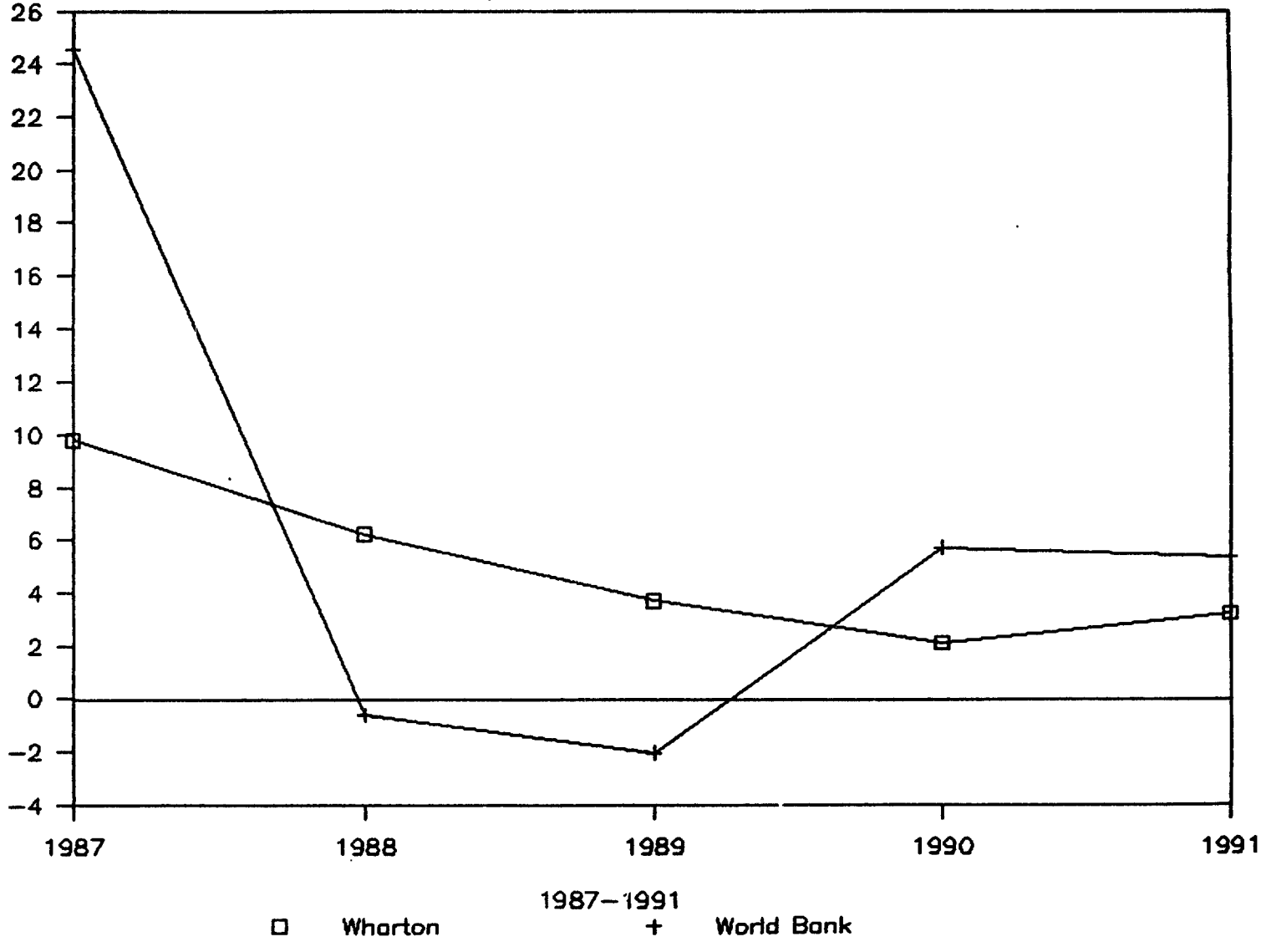
# Forecasts of Other Cereals' Prices

( percentage changes )



# Forecasts of Agri. Non-Food's Prices

( percentage changes )



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